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MAJOR-GENERAL SIR ROBERT BIDDULPH, G.C.M.G., C.B., R.A.,  
Inspector-General of Recruiting, in the Chair.

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### VOLUNTEER FIELD BATTERIES AND HOW TO HORSE THEM.

By Captain C. HALFORD THOMPSON, h.p., R.A., Hon. Major 1st Volunteer  
Devonshire Brigade R.A.

For years past those who rule our Army have steadfastly set their faces against any attempt on the part of Volunteers to form field artillery, utterly regardless of the fact that there is a good deal more than a mere risk that at the moment when an invasion of this country is attempted, we may be absolutely denuded of all regular field artillery, and have to meet the enemy with a very untrained army of Militia and Volunteers, who, instead of being able to look for the support of a powerful field artillery to make up for their want of training, would have to face the enemy with hardly a single gun to back them. The vast expense of permanently keeping up a larger field artillery in this country puts that method of getting out of the difficulty out of the question. I am thankful to see that at last the authorities seem inclined to look into the question of the possibility of forming efficient Volunteer field batteries, and as one of the few who have had any real experience in this matter, I have written the following paper, in which I propose to show—

1st. The absolute necessity of organizing a force of field artillery, apart from the batteries of Royal Horse Artillery and Royal Artillery on home service.

2nd. The possibility of forming Volunteer field batteries which shall possess sufficient "mobility" for above purpose, and the best mode of ensuring a supply of serviceable horses for such batteries.

My first point does not require much demonstration to any one who knows the present strength of the horse artillery and field batteries of the Royal Artillery on home service.

There are eight batteries of horse artillery, thirty-nine field

batteries, and six dépôt batteries on the Home Establishment.<sup>1</sup> If engaged in a foreign war, after deducting those serving at the Cape or in Egypt (both which stations are supplied from the Home Establishment), almost the *whole* of the remaining batteries would have to go abroad, leaving only the dépôt batteries in this country, which could not be counted on as of any use in repelling an invasion of England.

At first sight it would appear that in such an emergency as the disposal of nearly all our field artillery on active service abroad, their place could be taken at home by forming batteries from the men who had passed into the Reserve from that branch of the Service, but such a use of the Reserve would be impossible. So far as the field artillery are concerned, the Reserve would do no more (if so much) than fill up the batteries to their war strength and replace casualties, bearing in mind that a large proportion of these batteries have to be completed from four to six guns, thus requiring a corresponding increase of men.

The system of service in the artillery is different from the line in this respect, for enlistment with them is for twelve years, seven with the regiment and five with the Reserve, but at the end of the seven years every man has the possibility of remaining (with the approval of his Commanding Officer) the rest of his time *with his battery instead of passing* to the Reserve, and so many avail themselves of this, that the Reserve is, as I have above stated, no more than sufficient to complete the batteries, and could not be looked to for any assistance in forming batteries for home defence.

I have stated that in case we are involved in a European war, the whole of our available home force of horse and field artillery would be required for foreign service. In proof of this I will merely point out that we could hardly engage in such a war without placing in the field two Army Corps of 35,000 men each, and that the recognized proportion of guns for that number of men would be 3 per 1,000, or 105 for each Army Corps—210 in all, which is equivalent to 35 batteries of 6 guns each, or 210 guns, whereas our *entire* force on the Home Establishment is only 47 batteries, or 282 guns, with 6 dépôt batteries, which cannot be included in the calculation. Of the 72 guns remaining, 6 are now employed at the Cape, leaving 66 guns, or 11 batteries, to meet—

(a.) The possibility of some portion of the Army being required in Ireland.

(b.) The chance of more than two Army Corps being required in the field.

(c.) A demand from India for more field batteries.

(d.) The necessity for increasing our forces at the Cape and in Egypt on the outbreak of war.

I feel certain that even should the artillery of the regular Army, using all its Reserve, be able to place every gun in the field, it will be admitted that they will not have a battery to spare for other than

<sup>1</sup> After allowing for the alteration in the establishment by reduction of five batteries of horse artillery.



the above-noted objects.<sup>1</sup> Granted, then, that the country will virtually be denuded of regular horse and field artillery, what have we to replace them? Literally *nothing*.

An invasion attempted at such a time (and it is *the* time, if ever, when all must allow it will be attempted) would find our Militia and Volunteers forming the bulk of the forces to oppose it. As it was said, in a discussion at the United Service Institution some years ago, "The presence of the regular troops may be, in the first moment of invasion, considered an accident, and their functions should be of manœuvre as a reserve, to consummate the defeat prepared by the resistance of the Militia, to which we must now add, of the Volunteers."

The great improvement in the efficiency of Volunteers since the above words were spoken (in spite of the little encouragement they have met with) has made such a struggle less unequal than it would have been, but it is an old axiom in war, that with an untrained and badly disciplined army the proportion of artillery should be much greater than with an army of veterans. We have 340,000 Militia and Volunteers. Deducting from this amount the garrison artillery who would be employed in manning our forts, we have an army left of nearly 300,000 men, who, according to the ordinary proportion of three guns per thousand, ought to have 900 field guns, but who really from being untrained troops ought to have more, whereas they simply *would not have a single gun*. Under such circumstances what chance would they have against the picked troops of a European nation? and depend upon it no invasion will be attempted except by picked troops.

There is another reason too why the absence of field artillery will be fatal to us, viz., that it will prevent our making head against an enemy when he first attempts a landing. *This* is the time when an invasion may be nipped in the bud, but *not* without field artillery of the heaviest metal that is compatible with being brought into position without great difficulty.

A battery of 20-pr. Armstrongs would at such a moment be invaluable. Once let the lodgment be made, and the advantage will all be on the side of the most disciplined troops.

This brings me to my second point, viz., the possibility of forming Volunteer field batteries, and of ensuring a sufficient supply of serviceable horses for them.

For some years past I have commanded a battery of Volunteer artillery which till now has been armed with 20-pr. B.L. Armstrong guns, but the "powers that be" have just thought fit to order me to return the 20-prs. to store, making the battery an ordinary garrison

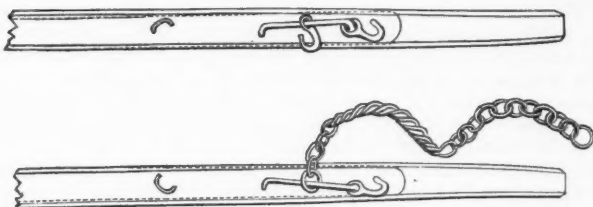
<sup>1</sup> I see that Mr. Stanhope, in his speech upon the Estimates, states that "after providing for wants of two Army Corps we should have *fourteen* field batteries left which would be used to form a small-arm ammunition column."

I conclude Mr. Stanhope includes the depôt batteries in his calculation, which I think cannot safely be done.

The providing for the needs of the Army in the shape of an "ammunition column" makes it still more unlikely that there will be any field batteries to spare.

battery, in spite of the very strong recommendation of the Officer Commanding Auxiliary Artillery in the district that we should be left *in statu quo*.

Although the guns were for some years left in my charge, I received an order shortly after taking command to return my harness to store. I then set to work to adapt the shafts of the guns and wagons for the use of farm horses using their own harness, and I found that by a most simple arrangement, consisting of a short chain attached to the off shaft passing over the hollow of the pad of the shaft horse and hooking on to a loop on the near shaft, any horse could be put into the shafts with his ordinary cart harness on. The near horse (wheel) and the leaders were of course attached in the



ordinary way. The general appearance of the turnout is very slovenly looking to any one accustomed to the beautifully fitted harness and splendid equipment of our horse artillery, but for all that it is efficient though rough, and more than that, it is much more suited to the class of horses employed than military harness, however well fitted, would be. Before my military harness was returned to store, I had some parades, and found that the horses had the strongest objections to their unaccustomed gear, while harnessed as I have described I have kept up an average of 4 miles an hour on a march of 8 miles out, and after drill a similar distance home again in the same time. The horses were driven from the limber box ordinarily, and led where accurate driving was required.

To this proposal the query will be raised, how are you going to ensure getting your horses if you are wanted for service? and it is to answer this objection that I have really been induced to write this article, for it does seem at first sight a fatal one.

The arrangement is as follows, viz. :—Contracts with neighbouring farmers, of which the following is a copy. It will be noted that in these contracts 10s. a day was paid for hire of each horse, the owner foraging them, but as in this paper it is proposed that forage be found for his horses by the Government, the cost of hiring has been calculated at 8s.

*No. 8 Battery, 1st Devon Artillery Volunteers.*

AGREEMENT between J N , of Farm, Broad Clyst, Devonshire, and Captain C. Halford Thompson, and his succes-

sors in the command of No. 8 Battery, 1st Devon Artillery Volunteers. The said J N agrees to supply the following horses for the use of No. 8 Battery, 1st Devon Artillery Volunteers, whenever they may be required, or to supply other horses of equal value in their place, in the event of their being in the opinion of the Officer commanding the battery no longer fit for service. The terms on which the horses are to be supplied shall be ten (10) shillings per diem for each horse for each day or part of a day that they are retained for, and in the event of the battery being called out for service the Commanding Officer thereof shall have the absolute right to purchase the horses hereinafter referred to at a price of 45*l.* (forty-five pounds) for each horse, and in the event of any of the horses not being in the opinion of the Officer commanding the battery fit for service, the said J N shall supply another horse in its room at the same price of 45*l.* (forty-five pounds), such horse to be sound and fit for service to the satisfaction of the said Officer commanding the battery.

*Description of Horses hereby Supplied.*

No.	Age.	Sex.	Colour.	Distinguishing marks.
1	6	Mare	Grey	Black points, star on forehead.
2	7	Mare	Grey	Black points.
3	7	Gelding	Bay	Black points, star on forehead, near hind coronet white.
4	8	Gelding	Bay	Black points, off fore and near hind coronets white.

This agreement shall continue in force until the thirtieth day of June, 1886.

Signed at Exeter this twenty-seventh day of May, 1885.

C. HALFORD THOMPSON.

J N

These contracts, which were of course stamped, I have never had any difficulty in getting taken up to the extent I want, and I am certain that no difficulty would be found in getting them taken up throughout the country, and probably at a lower rate for the hiring than I have given if the owners could be informed that the horses would be required for eight days every year at the end of September—a time when their crops are in, and when they would be glad enough to be making money by their horses instead of their standing idle. As to the clause in the contract referring to purchase, I never have found an objection raised to it. Farmers as a class are men who know what is best for their own interests, and have to look at the position from two points of view—

(a.) An annual return for hiring out their horses, with the saving

of their keep while out, and the chance of having to sell them, should invasion be threatened, at their present market value, instead of the enhanced price that such a crisis would ensure him.

(b.) No present transaction or incoming, but a chance of selling the horses at say double their market value when invasion is threatened.

I think all will agree that the Devonshire farmer is right who accepts the proverbial "bird in the hand" as being better than "two in the bush."

I am of course aware that the class of horses I am alluding to would not be suited to the ordinary work of field artillery; they are not fast enough, and are altogether too heavy, but for the work which Volunteer field artillery would be put to they are thoroughly suited. Such batteries would not be wanted to perform intricate manœuvres; all that they are or should be required to do is to bring the guns to a suitable position. They must have speed enough and be tractable enough in harness to move along a road without getting in the way of other troops, and agricultural horses *working in their own harness* are well fitted for this. As for manœuvring, I will even go further, and say that in an enclosed country like England it is doubtful whether *any* battery would be able to leave the roads except for short distances.

According to the latest Census Returns, there are 2,000,000 horses employed in agriculture, and 1,000,000 employed privately or in trade, making a total of 3,000,000 altogether, and in a recent paper by Colonel Ravenhill, R.H.A., Inspector and Purchaser of Remounts, read before the United Service Institution, the writer calculated that out of this vast number only 70,000 horses would be really available for Army purposes, *i.e.*, for the regular troops, after deducting, to use his own words—

"Those too young or too old, the too small, too big, and those unsound or otherwise unfit." In this number, he says, "are included the high-fed London carriage horse and the well-stalled hunter," but the truth is Colonel Ravenhill *flies too high*. If it is a necessity of war to have evenly matched teams and highly-bred horses, he is right; but I confess I do not believe in such a necessity. I remember that in a seaside town in the north of England it is the practice to always harness a big horse and a pony side by side in an omnibus, and though it looked odd I can vouch for the pace they used to rattle along and the amount of work the horses did. I do not advocate the "Redcar Omnibus" principle for general use, but I do say that it is possible to be too particular. Anyhow, I am rather glad, for the sake of the object I have in view, that such an authority as Colonel Ravenhill *excludes* agricultural horses from the supply of the regular army. That being so, there can be no objection to Volunteer field batteries drawing their supply from that source, and I will now briefly state how I think these batteries should be formed. For our 300,000 Militia and Volunteers we *ought* to have at the very least 100 batteries of six guns, which would be ten batteries for each of the seven English, the Scottish, Welsh, and North Irish Divisions. Each battery would

require 75 horses as per following Table A; so the total number wanted would be 7,500, a number that, under the system I propose, there would be no difficulty in raising out of the total of 2,000,000

TABLE A<sup>1</sup>.—Showing Number of Horses required for a Volunteer Field Battery.

	Total No.
Six guns and wagons at four horses each .....	48
One forage wagon at four horses.....	4
Three store carts for tents, &c., at two horses each	6
One sergeant-major.....	11
One quartermaster-sergeant.....	
One drill-sergeant.....	
Six sergeants.....	
Two trumpeters .....	6
Spare horses .....	
Grand total .....	75

agricultural horses, if it was energetically taken in hand. It would also involve an increase of the Volunteer artillery of about 12,000<sup>2</sup> men, for it would not be desirable to decrease the number of Volunteer gunners who are so sorely wanted to man our coast batteries. But here again I consider no *real* difficulty would arise, for these batteries would undoubtedly be popular, and the increase would tend to reduce the present deficiency in numbers existing in the Volunteer Force, amounting to over 40,000 men. I think, too, that it would be possible to engage men for them who would undertake to be present for eight days' training in the autumn of each year, such training to take place at a *fixed* period—say the end of autumn, and I would make this a definite part of their engagement when enrolled. There is no difficulty in getting men in the Yeomanry to attend a week's training, so I do not see why this difficulty should be insuperable. Of course during the time they are out they would have to be *paid*—and *well paid*. If these batteries are to be formed there must be an end to the miserable cheese-paring system that the Government have hitherto adopted in dealing with Volunteers. I am quite aware that in advocating *payment* for Volunteers I shall raise a storm of criticism, but the Government pay Yeomanry when they are out for training, and why should they object to pay Volunteers under similar circumstances? Depend upon it the respectable artisans of this country *cannot* leave their work for eight days' training without pay, and *THEY* are the men we want for these batteries, and they are the men, too, who would be invaluable if the batteries are called out for actual service.

I should like, where possible, to see them commanded by retired Officers of the Artillery. I am sure there are many such who would

<sup>1</sup> This table does not include Officers' horses, which they would themselves provide. The forage wagon and store carts would carry the tents and whole camp equipment of the battery, as well as two days' forage.

<sup>2</sup> The strength of each battery is shown in Table B at end of paper.

gladly accept the command, but they *could* only do so (except in rare instances) if the command involved no expenditure out of their own pockets.

The guns of these batteries would be parked at their respective headquarters; and here, again, some outlay would be necessary in the first instance to supply proper gun-sheds and a suitable drill-shed for each battery, for the Volunteer gunners would of course drill there throughout the year. A sergeant from the field artillery would be attached to each battery as instructor. I would strongly urge that the guns themselves be of moderate weight only. A corresponding gun in weight to the Armstrong B.L. gun of 16 cwt. would be quite heavy enough. If too heavy a gun be used it would not be possible to take up a position far from a road. I consider the Armstrong 40-pounder, which has been talked of for such a purpose, is much too heavy, being more than double the weight. The nearest gun in weight to the 20-pounder Armstrong is the 25-pounder rifled muzzle-loading gun of 18 cwt., and, as a good many of these guns have been made and will soon be superseded in the regular Service by breech-loaders which have again taken the lead in the ever-changing kaleidoscope of our artillery, I would suggest these guns being issued for Volunteer field batteries. It would be desirable that all these batteries should be armed with the same guns; and there are not sufficient 20-pounder Armstrongs in existence for this purpose, very few of that sort having been made. Moreover, the 25-pounder R.M.L. gun is a better one in every way.

The batteries should be distributed about the country places not in any case more than 40 miles or less than 25 miles from the place where their annual practice is to be carried out. They should be far enough from each other to ensure their not clashing with one another in getting contracts for horses. For instance, I would propose that the ten batteries in the western district be distributed as follows, viz. :—

Headquarters.	Annual practice to be held at
Exeter .....	Okehampton.
Honiton .....	Exmouth.
Barnstaple .....	Lynmouth.
Taunton .....	Burnham.
Wells .....	Burnham.
Monmouth .....	Newport.
Ashburton .....	Okehampton.
Tavistock .....	Okehampton.
Tiverton .....	Exmouth.
Truro .....	St. Ives.

The object in putting the batteries from 25 to 40 miles from their practice ground is to give them two days' march from headquarters to the place where they hold their practice, their eight days' training being thus employed four days on the march and four days (including halt for Sunday) at practice ground. The batteries would carry everything with them, including forage and camp equipage. The latter

(camp equipage) and the blankets for both men and horses would be part of the equipment of the battery. Only two days' forage would be carried with the battery as it would be replenished at the practice station.

Each battery should be a distinct command under a Major, the whole ten batteries of the brigade being under the command of a Lieutenant-Colonel who would be detailed from the Royal Artillery. Volunteer Officers would not be promoted to the command of the brigade, but, to compensate them for this loss of promotion, they should be allowed to have brevet rank as Lieutenant-Colonel and Colonel after a certain number of years' service, such rank to be REAL and not the mere sham which "Volunteer honorary rank" at present is; the holder of the brevet rank to take command of "mixed detachments" in virtue of it.

The Royal Artillery Lieutenant-Colonel would also act as Inspecting Officer.

The Adjutant of the brigade would be expected to see that the contract system with farmers for the horses of the different batteries of the brigade was properly carried out, and a proper register kept of them.

Officers commanding batteries would account direct to Government for all payments to their respective batteries, and in the event of their batteries being called out for service would purchase the horses from the contracting farmers.

I have appended tables to this paper showing the estimated cost of a battery under my proposed system. It will be noted that I have put the Capitation Grant at 2*l*.—a slight increase on what the Government now propose to raise it to. It would be necessary to allow the Commanding Officer to draw two-thirds of his Capitation Grant in advance and the balance immediately the year is completed, and not make him wait, as is now the case, till six months after the Capitation Grant has been earned. It is this, more than anything else, that has deterred half-pay Officers of moderate means from joining the Volunteers; for to keep a battery (such as the one I now command) going, it is absolutely necessary for the Commanding Officer to be in debt to his bankers. It really comes to this at present: with Volunteers the clothing and equipment of each man have to be found and paid for; but the Government pay back nothing for 18 months. With these proposed field batteries no one would take command on such terms.

It will be seen from these tables that the total cost of one Volunteer field battery would be 694*l*. 14*s*. per annum, and of a brigade of ten batteries 7,987*l*. The cost, therefore, of the 100 batteries would be under 80,000*l*. per annum. Surely a very small sum to a nation like ours, if they can once be got to look upon it as a "national insurance." I notice that in the speech I have already referred to, Mr. Stanhope stated, "I must honestly say I should be very glad to have more field batteries." I hope by this paper I have shown it is possible to have them, and, even if the Government are not disposed to try any experiment of this sort on a large scale at first, they might at any rate form a brigade of ten batteries to give it a fair trial.



TABLE B.—*Showing Strength of a Battery as proposed in this Paper, and Cost of Calling it out for Eight Days in each Year.*

No. of each rank.	Rank.	Pay per diem.	Total of one day's pay.	Total of eight days' pay.	Remarks.	
		<i>s. d.</i>	<i>£ s. d.</i>	<i>£ s. d.</i>		
1	Major .....	}	..	..	{ No pay estimated, vide remarks in paper	
1	Captain .....					
3	Lieutenants ...					
1	Surgeon .....	}	3 0	1 4 0		
1	Sergeant-Major					
1	Quartermaster-Sergeant....	}	2 6	1 0 0		
6	Sergeants .....					
6	Corporals .....		0 9 0	3 12 0		
6	Bombardiers...		0 7 6	3 0 0		
2	Trumpeters ...		0 3 0	1 4 0		
92	Gunners .....		4 12 0	36 16 0		
120	..	..	6 9 0	51 12 0	Total of pay.	
114 rations (exclusive of Officers) at 1s. per man per day .....				45 12 0		
Grand total of cost of pay and rations ..				97 4 0		
Cost of 75 horses' forage for eight days at 1s. 10d. per horse per day .....				55 0 0		
Hire of 75 horses at 8s. per day per horse.....				240 0 0		
Expense of camping grounds .....				30 0 0		
Grand total .....				422 4 0		

TABLE C.—*Total Annual Cost of a Volunteer Field Battery and of a Brigade of Ten Batteries as proposed in this Paper.*

Capitation Grant:—	<i>£ s. d.</i>	<i>£ s. d.</i>
120 Officers and men at 2 <i>l.</i> each .....	240 0 0	..
Extra grant for five Officers and eight sergeants at 2 <i>l.</i> 10 <i>s.</i> each .....	32 10 0	272 10 0
Cost for calling out for eight days per annum. ( <i>Vide</i> Table B) .....	422 4 0	422 4 0
Total cost of one battery.....	694 14 0	694 14 0
Total cost of brigade of ten batteries as above....	6,947 0 0	6,947 0 0
Ten drill-sergeants at 68 <i>l.</i> per annum for pay and allowances .....	680 0 0	..
One Adjutant .....	260 0 0	..
„ travelling expenses.....	100 0 0	1,040 0 0
Grand total for ten batteries .....	7,987 0 0	7,987 0 0

To this must be added cost of ammunition for practice and of the first cost of tents and blankets. The whole cost of clothing and equipping the battery would be paid for out of the Capitation Grant; out of which would also be paid the interest on any money expended on erecting drill-sheds.

Colonel SHAKESPEARE: I have had the honour of commanding the volunteer field artillery of Middlesex, so that I can tell you what the volunteer field artillery can do, and probably there is no man living who can tell you more about it than I can. Some years ago, I think during the Franco-Prussian War, there was an outcry as to the deficiency of field artillery. I wrote a letter in the "Times," the result of which was that I was asked to take the command of the volunteer field artillery of Middlesex. My answer was, that the whole question of volunteer field artillery seemed to me to be ridiculous, and I laughed at it. They then said to me, "Will you come up to London to look at us?" I went, and they had a parade for me of twelve guns at the Wellington Barracks. I looked at them with a most scrutinizing eye; I did not care about their being splendidly turned out, clean, bright, polished, and all that sort of thing, but the effect was that I soon said, "There is work in these men and horses," so I took the command and went to drill on Tooting Common, and I was surprised to see what they did. I took them down to the Brighton review. They halted at Redhill, and got down to Brighton without an accident of any description. We were billeted there on the Saturday and Sunday, and we fought what I call the battle of Brighton on the next day. I was very anxious about the matter, and particularly wished to have my own opinion well supported, and therefore I asked General Lindsay to let me have two Officers of the field artillery as my aides-de-camp. He gave me Colonel Tod Brown and Major Hobart, just the men I wanted. I had the command of the whole of the volunteer field artillery of the defending force. After a certain time we had to retire. I had placed eighteen guns in action on Wick Hill, and we had to retire. My two aides-de-camp said to me, "They will never get over that ditch, hedge, and bank," but I replied, "You shall see what they will do;" and they did get across. I do not mean to say they got across without some of their teams being down, but I have seen Royal and Horse Artillery teams down, but they all got up again. Those guns ascended Redhill in splendid style. I said to the Officers, "Look out, and when you see the opportunity give the advancing enemy a parting shot." They got up to the top, and Earl Wemyss admired the splendid style in which they went up that hill. Nothing whatever went wrong that day. We marched back to London, nothing went wrong, not even a saddle gall or a collar gall. There was a great deal of writing to the "Times" about it at that period, and it was said to me, "Look at your harness; you are sure to find collar galls." I laughed at the idea, for I took special care that the horses wore their own collars, the omnibus collars. They were omnibus horses of London. All the harness was artillery harness, except the horses' collars; that was the way we did it. Then they said, "Oh! but you know the omnibus horses will never stand the noise; they will never stand when the guns fire." "What!" I said, "the London omnibus horse won't stand the noise? Why he is just the very horse that will stand noise." The whole question was fought out at that time. There was a deal of bitterness about it, and I will tell you why. The Government had made up their minds to abolish volunteer field artillery. I think it was Colonel Creed, of the Indian Horse Artillery, who commanded the Middlesex Artillery before I did so. I did not know when I took command that the Government had made up their minds, but they had done so and decided that the volunteer field artillery should be abolished. We got through the Brighton campaign in splendid style, and Earl Wemyss was so much interested in the matter that he used to come out to drill with me and ask me to take the guns out to Tooting Common and Wimbledon Common. We went down to Wimbledon on several occasions. There is some very ugly ground behind the butts, and Earl Wemyss was very anxious to see how we could get over that ground. It was very broken ground, full of holes, furze bushes, and that sort of thing. I trotted the guns across the place. It is true some horses went down, but they got up again. I will not enter into the question

of expense and that sort of thing, but the fact was, I got my horses entirely from the omnibus contractors of London, and I paid them 10s. a day for each horse. They never failed to supply me with splendid horses. I can only say, as far as my humble opinion goes, that I believe a volunteer field artillery would be a most efficient force. The driving is the real difficulty, but I used to teach driving in the Duke of Wellington's Riding School, and in proof of what I say I can tell you that we never had an accident. I have said very much the same sort of thing in this theatre before when Earl Wemyss was in the chair. You know how he has written on the subject, and even in January last there was a letter from him in the "Times" calling attention to the splendid turnout of the "Shakespeare" field artillery. One drawback from which we suffered was this. It was very much desired that one battery should go to the autumn manœuvres. First of all came the question of expense, but that was entirely got over. But then came the question of fourteen days. A great many of my men were well-to-do men of business, solicitors, and men of that sort. They would have enjoyed the affair very much, but they said, "Where will our business go to? We cannot go for that length of time. If it was a question of war, there would be no business to do and we could attend to it, but in times of peace we cannot give up our time to go out to manœuvres." If I ever can say a word in support of the most efficient turnout of volunteer field artillery, I will always speak it for general good, since other batteries can be made equally efficient.

Major-General H. BRACKENBURY, R.A. : The subject which the lecturer has introduced to us to-day is one of national importance. The lecturer occupies an irresponsible position; I speak with the responsibility which attaches to me as the head of the Intelligence Department of the War Office, and I think it may be of some interest to this audience gathered here to-day if I state how this question which has been brought before us bears upon the great national scheme of defence that has been lately matured at the War Office, and which is known to the public generally as the Mobilization Scheme. In order that I may make you understand clearly what this Mobilization Scheme is, and of what it consists, I must first very briefly state what are our necessities in case of war with a great maritime Power. Our first great line of defence is our Fleet, and the duty of that Fleet, as recognized by the Admiralty as well as ourselves, is to go out into the high seas, to seek the enemy's ships the moment they leave their ports, and to send them to the bottom of the deep. The duty of our Fleet is not to defend our dockyards and our commercial harbours at home, it is not to defend our Imperial fortresses and coaling stations abroad. That duty falls upon the Army; and unless our Imperial fortresses and our coaling stations abroad are properly fortified and properly armed, and their armaments properly manned, our Fleet cannot keep the sea. Unless our dockyards at home are kept absolutely secure from the enemy our Fleet cannot keep the sea; and if our Fleet cannot keep the sea, the whole of that enormous commerce, which is the life-blood of this nation, will be swept off the sea. Unless our Fleet can keep the sea, within three months the inhabitants of the British Isles will begin to die of starvation, for the food supplies necessary for existence will not be forthcoming. There are also certain commercial ports which it has been decided must be defended not only as harbours of refuge, but as ports which are the termini of the great lines of the food supply of this country, to which our food supply must be brought, and in which our cruisers, for we must cover the sea with fast cruisers in case of war, must be able to take shelter. Having said that much, I may next add that all of us who have had to think this matter out seriously are convinced that it is utterly futile to think of attempting to guard every portion of the enormous shores of these islands. We must concentrate our forces, we must select the points which are to be defended, and we must then have one great concentrated system of defence against that enemy who having succeeded, which God forbid that he ever should, in sweeping our Fleet off the sea, should effect a landing with say 100,000 men crowded together in swift steamers, and thrown rapidly across to this country. How does this bear upon our Mobilization Scheme? The first step which we endeavoured to take was to get laid down definitely by authority what were to be the places at home and abroad which were to be defended. That has been done. Secondly, to settle upon the very best authority what are the garrisons of all arms respectively

which are required in those positions which are to be defended. That has been done. Next, to take the extraordinary and heterogeneous mass of men which constitutes our Army, to examine into it, and to see what we can do with it; first, towards meeting all the requirements for the garrisoning of the points which form the base of operations and the line of communications of our Navy, and which for other reasons it has been decided to defend, and, secondly, towards placing an army in the field. Now, Sir, that was the work of my department for very many months last year, and we gave to it the closest and the most careful attention. The result of our labours, after due consideration by the military authorities, was laid before the then Secretary of State for War, Mr. Smith. Mr. Smith approved in bulk the scheme as it stood; and Mr. Stanhope, his successor in office, has subsequently endorsed that approval. You must all be well aware that these high Officers of State would not approve a scheme of this importance without having given to it the most careful consideration, without having heard from all their many advisers all that was to be said against it, as well as all that was to be said in its favour. Now, Sir, having said that, let me tell you briefly what is the result of our calculations. First of all, I will take the garrisons. We considered that it was desirable as much as possible to set free our regular troops for service with the field army, and that our garrisons at home should be to the utmost possible extent supplied by the militia and the volunteers. We have utilized not the whole of our militia infantry, not the whole of our volunteer infantry for the garrisons, we have scarcely used any regular infantry at all for those garrisons. We find that after using the whole of our militia artillery for the garrisons, and a very large portion of our volunteer artillery (and I will speak in detail of this in a moment), we are, for garrison purposes, unless we bring a number of volunteers from the extreme north and centre of England down to the south, still some 3,000 garrison artillerymen short for the defence of these islands. Here comes in a very important point, to which I invite attention. In the event of war with a great maritime Power becoming imminent, it would be absolutely necessary for us to establish our garrisons in those places that are to be defended before the actual declaration of war. At the present day, certainly within twelve hours of the declaration of war, torpedo-boats might appear in Portsmouth and Plymouth harbours, an enemy's cruiser might appear in any of the commercial ports that have to be defended, and serious damage might be done. I may say, then, speaking of all these matters after careful consideration with my colleagues, it is my deliberate opinion, that the garrisons must be established in these places before the actual declaration of war, if the war then imminent be with any great military Power near at hand, and that of course is our greatest danger. How long will those garrisons have to be maintained? Throughout the continuance of the war. And, now, seeing before me many distinguished volunteer Officers, I will ask them whether it is possible that the whole of any one of their volunteer corps could be maintained in a garrison distant by rail an hour or two hours from the place where the men live. Could they be taken as a body of troops, put into a garrison, and the whole of them kept there during the continuance of a war which might last for many months? We consider that that is practically impossible. And the basis upon which our scheme has been worked is this—that one-half of the volunteers actually living in any seaport to be defended may be considered always available for garrison duty. We have taken no Volunteers for any of these defensive purposes who live at a distance of more than two hours by rail from the port to be defended, and we have considered that only one-fourth, or in some peculiar circumstances one-third of those Volunteers who live at any distance by rail from the place to be defended, would be constantly available for garrison duty during the continuance of a war. This is the basis upon which we have counted the strength of the Volunteers. We have not assumed that the whole Volunteer force is available for garrison duty during the continuance of a war, but we have assumed that one-half of those who live in any seaport to be defended, and from one-third to one-fourth of those living at a distance from it, would be actually permanently available for garrison duty throughout the continuance of a war. We have, of course, assumed that the whole of the Militia and Yeomanry are available if necessary. The Yeomanry we do not use for garrison purposes; but the whole of the militia artillery are available. And I again repeat that after using every

militia artilleryman in the United Kingdom, every Royal garrison artilleryman in the kingdom, and every volunteer artilleryman on that basis of one-half to one-fourth of those living within two hours' by rail, we show a deficiency of very nearly 3,500 garrison artillerymen in the defence of this country. Now, I think the gallant Officer who has given us this lecture will understand why it is that his corps, which is at Exeter, which is very close to Plymouth, is told off to form part of the garrison of Plymouth. The garrison of Plymouth requires in case of war 5,300 artillerymen. The very greatest number of regular artillerymen that can possibly be spared for that is 1,100. We can only count upon 500 Volunteer artillerymen out of the 1,200 who are actually living within two hours' distance; and the remaining 3,700 have to be provided by bringing Militia from all parts of the United Kingdom. We have had to utilize all the Volunteers possible. Every volunteer artilleryman living within a reasonable distance of any port to be defended has had to be used, and still we have the great deficiency I mentioned of over 3,000 garrison artillerymen for the defence of the United Kingdom. Now, Sir, I come to the next point which I think will interest you. After making provision for the garrisons in the best way we could, still showing this terrible deficiency of garrison artillerymen, what surplus of troops does there remain? We have, I am happy to say, the regular troops for two army corps, infantry, cavalry, Royal Artillery, Royal Horse Artillery—after the conversion of a larger proportion of Royal Horse Artillery to Field Artillery than any other army in the world—we have infantry, cavalry, artillery, but we had not Engineers to complete two army corps; neither had we the Commissariat and Transport companies necessary; but I am glad to say that in the Estimates of this year there appear the sums necessary for the Engineers to complete two army corps, and for seventeen additional companies of Commissariat and Transport corps to enable us to put those two army corps into the field. That is one of the results of working out this Mobilization Scheme. Well, Sir, we have found after making provision for the whole of the garrisons in the United Kingdom and abroad, after bringing up our troops to war strength abroad, and after putting two army corps into the field, that there remains a small surplus over. There remains a very small surplus of regular infantry, some 5 battalions, 48 battalions of Militia, representing about 36,000 men, and 112 battalions of volunteer infantry, representing about 90,000 men. As regards cavalry there is a surplus of 7 regiments of regulars at disposal, and 39 regiments, or about 11,000, yeomanry. There will be of field artillery, as the lecturer has stated, absolutely none, except the depôts, and, therefore, I say that this subject that has been brought before us to-day is one of the greatest national importance. The Secretary of State has decided that to each of the twenty-one corps of volunteer artillery living at such a distance from the seaports that they have not been utilized in our Mobilization Scheme, he will give four guns of position. That would give to us eighty-four field-guns of position. But, Sir, a number of these corps are in Scotland, far away, and those that are not in Scotland are in the northern portion of England. It is especially in the south of England that volunteer artillery is most wanted; and those eighty-four guns, however useful they may be, would not, everyone must admit, be in any way whatever an adequate proportion of artillery for the 40,000 regular and militia infantry, and the 90,000 volunteer infantry who remain. These represent 130,000 infantry, and the proportion of 3 guns per 1,000 would be 390 guns, and not 84. In the Estimates of this year there appears the money taken for giving the 84 guns to those 21 corps, and I sincerely hope that the Estimates of future years may see the money taken for giving 390 guns to the volunteer corps who may be raised to man them. There is at present, I believe, a deficiency of 23,000 volunteers on the estimated number allowed, and I trust that we may succeed (and I believe that the authorities of the War Office are alive to the importance of this) in so regulating the number of Volunteers to be raised that we shall make our volunteer army like every other army, one which consists of a due proportion of the several arms. I do not propose to follow the lecturer into any of those details as to questions of horsing the guns and so on which he has laid before us. But I may say this, that all information of this nature which is given in this form is of the utmost value, because it enables the authorities of the War Office to weigh the cost of introducing, I will not call it an experiment, but any system of

this kind which is proposed, and it also enables them from testimony, based on practical experience of the possibility of making a really efficient field battery of Volunteers, to consider whether it is worth while to spend this money—whether they can get for it an article which will represent value for the money spent. My personal opinion is strongly in favour of having a large force of volunteer field artillery. I say that unhesitatingly, and I believe it is not until we have such a force that we shall really be able to consider these shores of ours safe from invasion. The cost of a single field battery of Royal Artillery is little less than 13,000*l.* a year in time of peace. There are, I know, many men, for whom I have the highest respect, who advocate that volunteer field batteries should not be raised because they will never be equal to batteries of the Royal Artillery, and who have the fear that, if these volunteer batteries are raised, the number of batteries of Royal Artillery will be reduced. Sir, I have not this fear. I believe that we have now established a definite unit of two army corps of regular troops, up to which we shall work constantly, and I believe it is hopeless to ask the nation to provide batteries of Royal Artillery in time of peace over and above what is required for those two army corps, in order that they may take the field with the volunteer infantry in time of invasion. Therefore it is that personally I advocate in the strongest manner the raising of a sufficient number of volunteer field batteries to give us three guns per thousand for the infantry which will remain after our two army corps and our garrisons have been provided. And therefore it is that I obtained permission from the authorities at the War Office to attend before you and to make this statement.

The CHAIRMAN: The President of the Council has received a paper from an Officer of the Royal Artillery, who is unable to be present, and the Council thought it would be agreeable to the meeting to hear this paper read before the discussion was further continued. General Erskine is in charge of the paper and will read it to us.

General ERSKINE: I may preface the reading of this paper by stating that it is the rule of this Institution that when a paper has been read and is being discussed it is not desirable to have written communications from gentlemen who are ready to express their opinions but are unable to attend personally. Every rule, however, has its exceptions. On coming into the Institution to-day this paper, which I have in my hands, was placed before me, and I think that as it is written by an Officer of the Royal Artillery of considerable experience and ability, it is desirable that the contents of it should be made known to the meeting: I will therefore with your permission read it.

#### Remarks by Colonel Richardson, R.A. :—

The title of the paper is misleading, for though Captain Thompson does in one part advocate a lighter gun than that likely for some years to come to be supplied to the Volunteers, yet the body of the paper is devoted to the method of raising and working what is certainly not and never could be an efficient *field* battery. A field battery to be of any use as such must be mobile—otherwise it is apt to be an encumbrance, especially in an enclosed country such as ours—and I think that a battery sufficiently mobile to be ranked as a field battery is more or less an impossibility to Volunteers recruited and maintained as our Volunteers at present are. It is enormously expensive, and requires constant training. I by no means say that Volunteers could not raise and establish an efficient field battery, but to do so they would have to volunteer the whole of their time and I think much of their purse. It would be cheaper for the country to establish an extra regular field battery, which could be sent anywhere, than to pay for a volunteer field battery even though the pay of the men was left out of account.

But I think there is an unsupplied want which the Volunteers can meet, and meet somewhat in the way Captain Thompson indicates. In India there are heavy batteries, not field batteries, armed with heavy guns, whose pace is a walk, which can practically go anywhere that field batteries can go, and which have proved that they can do so. They are moved by elephants and oxen, so at all times their pace is slow—but their presence would often prove of the greatest use to an army. We



have no elephants and very few draught oxen in England, but we have very powerful horses which India lacks, and I believe that it is in the line of these heavy batteries that volunteer artillery would shine.

In the event of the invasion which Captain Thompson mentions, such batteries would make it extremely disagreeable for an enemy to land, and again, supposing him to have done so, would rapidly render a village in which he might intrench himself untenable. The Royal Artillery have no organized heavy batteries at home, so that the Volunteers would not be hampered by any cut and dried methods, but might, as they did with rifle shooting, lead the regular Army in a struggle for improvement.

Of course for such a battery the best armament would be guns of the siege type, but as these are scarce, it is possible that the Volunteers would have to content themselves till they proved what they are capable of, with guns of position, and probably at first the 40-pr. Armstrong R.B.L. would be their weapon, though the sooner they could get a moderately heavy howitzer added the better.

I would suggest that the line they should take, should be to form really efficient heavy batteries of position combined with light siege batteries. For this purpose horses such as Captain Thompson tells us to get would answer admirably. To make up for the lack of elephants, steam power must come into play, and probably most volunteer corps could produce artificers quite capable of working a steam sapper, but on ordinary roads the horses would move the guns, ammunition, and intrenching tools. It should be the aim of such a battery to intrench its guns with extreme rapidity, and for this purpose many extra men would be required to those actually working the guns. These would be reliefs to the gun detachments, and should perhaps be carried with their intrenching tools at a greater pace than the guns could move—say at a slow trot; that the positions might be in a forward state of preparation by the time the guns arrived.

A wide scope for ingenuity is offered to the Officers of volunteer corps in the invention of efficient methods of moving the guns, conveying men, intrenching tools and ammunition, and in working out the best method of intrenching guns of position with the least labour, and I believe if such batteries as I have indicated commend themselves to the Volunteers, we should soon have much to learn from their experience.

Colonel F. S. HILL, C.B., M.P., Glamorganshire Art. Vols. : I have listened with very great pleasure to the paper which has been read by Major Thompson, and which has put in a very concise form his experience in a matter of very great importance. I have listened also with extreme pleasure to General Brackenbury's explanation of the Mobilization Scheme which he has been engaged in carrying out, and which I am sure we all rejoice to think has received the attention of the authorities. I venture to offer a few observations upon the subject under discussion, as having had the honour of commanding a brigade for twenty-three years, during some portion of which time I was in the possession of field guns. I am very glad indeed to hear the encomiums which Colonel Shakespeare has been good enough to pass upon those batteries of volunteer field artillery which he has commanded. My own experience very much confirms what he has said. There can be no doubt whatever that we shall all admit the want of artillery, which indeed has been acknowledged by everybody, not excluding the Minister of War, and which again has been emphatically referred to by General Brackenbury. No doubt if field artillery could be supplied by batteries of the Royal Artillery, that would be the best solution of the difficulty; but I am satisfied there is no Minister, past, present, or future, who would dare to get up and propose the necessary vote for such an expenditure of money; therefore I think we may conclude that we must look to the auxiliary forces to supply the deficiency. I do not think that General Brackenbury has taken into account one very important factor of the volunteer artillery force upon which we might rely in case of war. There is a very large number of men who have passed through our ranks and who have not forgotten the drill which they have learned, and who, if necessity arose, would flock back to us. You may look upon the present volunteer artillery as merely a nucleus. I am afraid to say, speaking of my own regiment, how many men have passed through it, but I should think something like 8,000; I am perfectly satisfied that Officers and men would offer their services most readily,



and in that way the deficiency of some 3,500 men which General Brackenbury has mentioned would be made up. This would also be a solution of the difficulty as to the possibility of volunteers giving up the necessary time for going into garrison and remaining there until peace was concluded. I think nowadays the probabilities of protracted war are not very great, but no doubt there would be considerable difficulty in getting the requisite number of men to go into garrison upon mere rumour. But the difficulty would be solved, I believe, by what I call our reserve men, and we should be able to provide from the volunteer artillery any amount of artillery that might be required. I think the requisite force might be provided in such a manner as to relieve the pressure of continued employment. Speaking for my own regiment, I feel I could guarantee that there would be a constant supply of something like two-thirds of our present number, which I could always undertake to put into garrison. We want artillery for different purposes; we want men for our forts, and we want movable guns for the purpose of preventing a landing. Prevention is far better than cure; and no expense, no trouble would be too great which put us in such a position as to render a hostile landing impossible. I myself have a strong feeling that if a landing were once permitted, we should have a very disastrous time before us before we got rid of the invader, although no doubt we should do it eventually. The difficulty of moving guns about to prevent a landing is that you must have a living organization. You cannot organize a movable battery in a moment; you must have your horses at hand and your men at hand, and therefore their position must be kept constantly ready. You can add to your garrison artillery, but you cannot add to your mobile artillery. I found, as regards the field guns, that I had no difficulty whatever in working them. The men took very great delight in the drill, and they attained a considerable amount of efficiency; in fact, there were some detachments that I would not have been ashamed to have paraded at the headquarters of the Royal Artillery itself. There was, no doubt, the question of the drivers, but we managed to get over that by securing some old drivers of artillery, which we had no difficulty in doing. These were supplemented by postillions, grooms, and men of that kind. The result was, we never killed anybody, and we never had an accident. We got the horses, it is true, with great difficulty. I took the horses out of cabs and omnibuses wherever I could; and if I had only had money to enable me to have arranged to have some horses constantly, I could have turned out a field battery that perhaps would not have compared with those of the Royal Artillery, but at any rate would have been very respectable, and would have been far better than some of the Continental batteries of field artillery which I have had occasion to notice. As it was I was able to move about, to perform all sorts of manœuvres which the Royal Artillery have to do in actual war, and to move the guns about with a body of infantry, working them both together. Eventually my field guns were called in and my opportunity was lost. I entirely agree with what has been said as to the desirability of having field batteries, and I do not think the number which Major Thompson proposes is too great. But I do not agree with him as to the mode in which he proposes to provide these batteries. I do not believe that it will be desirable to establish what I may call a rival branch of the artillery service. I think it would be much better for the field batteries to be provided by existing brigades. For instance, one field battery might be authorized to every six batteries of garrison artillery. That battery would be under the supervision of the commander of that particular brigade, and it would be a great assistance to the brigade to have this field battery; it would be a kind of promotion for both Officers and men to be posted to that battery. A rival organization would thus be avoided, and instead of it you would have something in your midst which would be an incentive and encouragement to the men to do their best. One field battery to every six garrison batteries would give seventy-one batteries. I think there are certain portions of the coast where there might be additional field batteries authorized, and that would come to something like the number that has been suggested. If it were done in the way I propose, the whole would be under the command of the Colonel of Royal Artillery commanding the district, who might assemble the field batteries occasionally for united drill, if deemed desirable. I hope whatever may be done may take this direction. Then, again, comes the question of storing these guns. I think it is important that sheds

should be provided, wherein guns can be stored, and most brigades already possess them. My own brigade has excellent headquarters, with all the arrangements for keeping harness and everything that could possibly be desired. On the question of having the battery out for eight days, no doubt the suggestion is a very good one, and might be done every other year, horsing the guns six times, as formerly, in the alternate years. But if called out for eight days' continued service, the men should be paid for it. We hear a great deal about the inexpediency of payment to Volunteers, but the lecturer proposes it at the rate of a shilling a day. Now, I do not think it is much inducement to a man to go out, if you ask him to give up four or five shillings a day and offer to give him a shilling. If you want drivers to be taken to Woolwich to have occasional drill, or if you insist upon having these field batteries out for eight days, you must be fair and pay the men in a more liberal manner. I believe when the Royal Mining Engineers are called out they have much higher pay; but it seems to me mere mockery to talk of paying men with a shilling a day. You may ask them to perform any extraordinary duties, and they will give their time; but you cannot expect a man to starve his family for eight days for the sake of his country. With regard to guns, I believe that the 9-pounder rifled muzzle-loading guns are now discarded from the Royal Artillery in favour of 13- and 16-pounders; and those guns would be probably obtainable in sufficient numbers to do all that I want. If we cannot have both wagons and guns at once, I would suggest that we might at all events have the guns. That will give us a chance of drill, and pending the arrival of the wagons and more complete equipment, we might at any rate have the guns. I strongly hope that something will be done in the way of giving us guns, and I believe it would be a very strong incentive in the way of encouragement to the men. I am satisfied my plan would work. It is a mere question of money, not a very large amount either. I venture again to say that the country may thank Major Thompson for the able manner in which he has brought the subject forward.

**THE EARL OF WEMYSS:** As my friend Colonel Shakespeare, without knowledge of my presence, referred to me, I should like to say one or two words upon the very interesting subject which has called us here to-day. I have listened with very great attention and pleasure to the paper read by Major Thompson, a paper I consider in itself very valuable and useful: but it is even more valuable and useful in the result which followed, which is that we had what I do not hesitate to say appears to me to be the most important and valuable military statement that has been made in my recollection within or without the walls of Parliament. What is it that we have all been endeavouring for years to get brought about? It is that the military power of this country should be organized by those who are responsible for the safety of the nation. We have been knocking for years and years in vain, no matter who has held the key of that office, at the doors of the War Office without result, and now happily we have a statement made, and its great value is that it is made by the authority of the Secretary of State, a statement made by General Brackenbury, whom we know to be an Officer of great military experience, a man of great ability and in high position, as the head of the Intelligence Department; and that statement so made I hold to be valuable and comforting in the present and most hopeful as regards the future. It is hopeful to me as regards the future because General Brackenbury, under the Mobilization Scheme, when he has to allot all the different arms and forces we have in this country, finds that deficiency which we have been in vain, in this room and elsewhere, endeavouring, in the Press and by every possible means, to impress upon the Government, which is that you have lots of men, excellent troops no doubt, but that you are deficient in the main elements which constitute forces in the field—in commissariat, transport, and with no artillery whatever. Colonel Shakespeare has referred to what he did with reference to field artillery. You find General Brackenbury, when he comes to allot all these troops, finds that he must have recourse to the Volunteers for field artillery. He has told you that they have taken this year provision for 80 guns, that they require some 200 more, and that next year he hopes further provision will be taken to equalize the guns required with the forces that will then be in the field—the Volunteers and Militia. Colonel Shakespeare has the merit of having shown to the authorities, as I can vouch, what can be done with field artillery. He

has referred to what they did at Brighton, also to what they did at Wimbledon. I do not think he did quite justice to what they did there. It was immediately before the Dartmoor manoeuvres. At the back of the cottage at Wimbledon there is a deep ravine, a boggy bottom with a ditch, and a narrow road with a ditch on each side of the road. When they were at the top of the steep part of this ravine I said, "Now, Shakespeare, do you think you can take your battery across that?" He said, "I do not know, but we will try." They did so, and the way they had to traverse that gully was with one of the wheels on the path and the other in the ditch the whole way down; then they had to cross the boggy ditch at the bottom. The horses and guns got bogged, but Colonel Shakespeare said, "Flog the leaders," and the leaders pulled the whole thing out, and they went safely across. I said to him, "People may say what they like about the inefficiency of volunteer field artillery, but I will engage that no horse nor field battery of Her Majesty's artillery at Dartmoor will go more successfully through a worse bit of ground than you have done to-day." For some reason or other—I do not analyze motives—the fact remains that whereas every encouragement possible should have been given to Volunteers to increase their field artillery in proportion to the number of infantry who would have to turn out if ever there were an invasion, cold water in every possible form was thrown upon it, and not only that, but they ended by abolishing first my friend Colonel Shakespeare and then our field artillery. I quite forget what it was he said or did, but Colonel Shakespeare somehow got into hot water with the authorities, doubtless through excess of zeal, and one day he came to me and said, "What am I to do, I am in trouble with the War Office?" Having heard his case I said, "If I were you I should put my resignation in their hands; they cannot possibly accept it." Well, he did put it in their hands, and they did accept it, I have no doubt to his astonishment, it certainly was to mine. That was followed by a General Order abolishing volunteer field artillery. The only question on which I beg to differ from Major Thompson as regards the capabilities of this force is as to their power of moving. I have told you what Colonel Shakespeare showed they could do at Wimbledon. We saw what they did at Brighton. Major Thompson seems rather inclined to think they must stick to the roads. We have heard the big 40-pounder field guns referred to which showed so well at the Brighton Review; they were not confined to the roads. General Erskine saw them as I did at the Brighton review under Lord Clyde. They were drawn by agricultural horses, with agricultural harness; their regular drivers in their smock-frocks drove them; and I know for a fact that those horses and guns from the time they were harnessed in the morning to the time they were unharnessed in the evening went over 32 miles of ground. Was it simply upon roads? Nothing of the kind. They manoeuvred up and down those steep Downs at Brighton and took up whatever position the Officer in command of the artillery told them to take up. I believe that if instead of giving them the cold shoulder the Government requested the Volunteers to form a volunteer artillery, whether of big guns of position or batteries such as Colonel Shakespeare so efficiently organized and commanded, such a request would be heartily and enthusiastically received. I think further it should be remembered in connection with the Mobilization Scheme that there is an enormous reserve of men who have passed through the ranks of the Volunteer Force. I am not in favour of going with an organization which costs large sums of money when a great deal can be done at no cost at all. I am perfectly certain the authorities have nothing to do but to say this: "We wish to form a reserve of Volunteers of different arms, we do not ask them to do more than to turn out once a-year in plain clothes and show that they exist. We do not want men above a certain age." I am perfectly certain if that were done the proposal would have a reception that would astonish the Government and astonish the nation. It is several years ago since I moved for a Return of the number of men who had passed through the Force. My good friend Major Macdonell of the "Volunteer Service Gazette" can probably bear me out as to what the figures were, but I think it was from 600,000 to 700,000; it is certainly nearer a million now, and of these we could get some 400,000 men certainly who would be perfectly capable of bearing arms, and who, I am sure, if appealed to, would readily do so. In conclusion, I have only to express a hope that General Brackenbury's statement will be widely circulated. I think it

is most important that it should be so, because it is most comforting, and if it is comforting to us at home it will not be comforting to those who may think of disturbing us from abroad.

Colonel RAY : The few remarks I propose to make will be rather upon the paper itself than upon what we have heard a great deal about this afternoon, viz., whether it is expedient to have volunteer field artillery or not. I think after all is said and done the whole question really resolves itself into this : Is there really sufficient regular field artillery or is there not ? If there is, there is nothing more to be said. Major Thompson, if he thought so, would not, I am sure, have given us his very interesting lecture. But, on the other hand, if there is not, and the time comes for an invasion or an attempted invasion, and field artillery has to be improvised in some way, which it surely will, is it not better in the meantime to do what we can to be in a more prepared state ? In the statement of the Secretary of State for War which appeared in the "Times," I daresay you will remember he said that after allowing a certain number of volunteer artillery for the garrisons and forts on the sea coast, there would be 12,000 men inland, whom he proposed should become field artillery. He also stated what has been repeated this afternoon by General Brackenbury, that he proposed to issue eighty-four field guns. In the "Times" it was distinctly stated "field guns;" it appears from what General Brackenbury has said that they are to be guns of position, or heavy field guns. I would ask, when the Royal Artillery are armed with the new breech-loading field guns what will become of the 20-pounder breech-loaders, of the 25-pounder muzzle-loaders, of the 16-pounders, the 13-pounders, and the 9-pounders now used by the Royal Artillery ? Will all these guns be returned into store at Woolwich ? Why, in the name of common sense, should they not be made use of and issued to the Volunteers ? There will be hundreds of these guns lying idle. I think the question of horses is not a difficult one. About twenty years ago the 3rd Middlesex Artillery, to which I have the honour to belong, used to take to reviews from twelve to thirty light field guns. The duty devolved upon me of finding horses for those guns at reviews. We used to pay not 10s. but 5s. a-day ; we had the Government harness for a time, using the farm collars. We tried for two or three years, when the guns and harness were taken away, to use farm harness with our heavy guns, but I must say that it proved a failure ; directly we got on hills or bad ground it broke in all directions. We had a number of short straps made 8 to 10 inches long, some with buckles at both ends, and with these we had to repair the harness temporarily. We applied for the loan of Government harness but did not get it again until within the last few years. In those days when we had field guns it was always said that we could not find efficient drivers for them. We did find efficient drivers, and in this way : we put an advertisement in the paper for twelve retired drivers of the Royal Artillery or mounted corps. We advertised in one daily paper and in two local papers, and the result was to that one advertisement we had about eighty replies. We paid these men like bandsmen, and clothed them when they turned out. They understood the manœuvres ; they had all been drivers in the Royal Artillery, and at an inspection of the field battery mounted the Inspecting Officer told me he could not understand how it was that our drivers did so well. Of course I did not tell him. There is another thing I should like to remark upon, that is the suggestion about having Volunteers out for eight days, and paying them. Now, I must totally disagree with that suggestion : Volunteers must be Volunteers and nothing else. I have not the slightest doubt that if men are wanted they will turn out. They turn out for nearly eight days at Shoeburyness without pay, and if they were really wanted they would no doubt do it. I think one particular way of threshing out this question might be if the Council of the National Artillery Association could be induced to take the matter up, and have authority to hold meetings and take evidence on the whole subject, and report upon it. They have the machinery for so doing, and it would be possible to obtain reliable information in this way.

Captain LAKE : General Brackenbury, being obliged to leave, has asked me to give a few figures which he omitted in his speech. He told us that the total requirements of garrison artillery for the home fortresses and seaports and the fortresses and coaling stations abroad was about 3,000 men more than our present strength. He wished to have added that in the Estimates for this year 900 of

these are provided for, and in next year's Estimates 900 more will be provided. So much towards supplying that deficiency of 3,000 men. In addition to this, for the coaling stations in the East 217 native artillerymen have been enlisted of the nature of Lascars, though not serving under the same name. I should like now to refer to a remark which fell from Colonel Hill when speaking of volunteer batteries of position. He said he would like to place heavy batteries at various places along our coast which could oppose and prevent the landing of an enemy. I think it may be regarded as certain that an enemy attempting an invasion of England will make straight for London. If London were once in the power of an enemy, our defence would everywhere be paralyzed. That being the case, can it be wise to scatter our forces by placing heavy batteries all round our coast at the many points where a landing might be effected, and would it not be far better to concentrate our forces round London, to have them in such positions that supposing an enemy had landed we could interpose our concentrated strength between him and his prey? Look at the same question from another point of view. A landing in force could hardly take place till our fleet was either swept off the seas or so seriously crippled as not to venture to engage the enemy and his convoy. That being the case the landing would be covered by the heavy guns of an enemy's fleet, and I do not think it is likely that any batteries of position could so successfully cope with the heavy guns of a fleet as to prevent or even seriously delay a landing.

General GOODENOUGH, R.A. : Lord Wemyss referred to the cold shoulder which had been offered in times past to the efforts made by the volunteer field artillery. I believe from what we have heard to-night it is pretty clear that those days are over. No doubt this discussion is one which will be largely read by Volunteer Officers about the country, interested in the subject, and I think possibly it might be useful to them if they could gather from the discussion some indications of the main points to which attention should be directed in establishing field artillery. Reference has been made to manœuvring guns, and I should like to say in my opinion that a very little amount of manœuvring drill is required for field purposes : but on the other hand, although manœuvring and galloping about and trotting about in the field is not much required, yet the power of going at a good pace along roads will always be requisite for anything at all approaching field guns of position. I remember, on the first occasion that I was ever engaged, I was acting with a body of men as escort to a battery. It was drawn by bullocks, commanded by the late General Enderby Gordon, and his conclusion at the end of the day was, how impossible it was to do anything with field guns drawn in that way on account of the utter inability to get a spurt out of them. It is generally necessary that you should be able to move your guns rapidly at some stage of the operations, and therefore, I think any development of the system of employing farm horses which are led by men on foot would not give satisfaction. In the long run I think it would be necessary that Officers should provide for the horses being driven by postillions. They must be able to trot along the road some distance, perhaps a mile or two, two or three miles, as far as their condition will enable them to do, and that cannot be done unless the men are mounted as postillions. The remark made by Colonel Hill, I think, chimed in very much with the reflections I made upon this subject when in command of the artillery of the south-eastern district. I had there an excellent corps of volunteer artillery, at Brighton, and they had had at one time some field guns. I could not help being impressed with the thought which I was glad to hear repeated by Colonel Hill to-night, that in towns where you have a large corps it is easier to provide therefrom one or more batteries of field artillery, rather than that the whole of a scattered corps, or the whole of a corps should attempt to devote its energies to that branch. It is not always easy to find Officers who are willing to go to the expense of providing themselves with horses, but in a large corps of six or eight batteries in a town, not only are horses more easily got for the guns of suitable quality, horses from omnibuses, vans, and so forth, but you are also likely to find a proportion of Officers with means who are able to mount themselves, which is not always the case in a scattered country corps, where the difficulty of finding a body of Officers able to

undergo the expense would be very great. I know at the present time one of the chief difficulties Volunteers have to contend with is that of finding Officers. The expenses are considerable, and there are many corps which have great difficulty in getting Officers to serve.

Captain TODD, 3rd Middlesex Artillery: The representative of General Brackenbury I think has proved the case of this paper more than any words that can be uttered by anyone here. He has stated that we are not likely to have a fleet firing away at our fortifications, yet all his scheme [is] on the organization of garrison artillery. He says most likely we may be fought in London, but anyone who knows anything about boxing does not know where he is going to be fought, and so he learns the general practice of his work and prepares himself for that work, so as to defend himself at any particular point at which he may be attacked. I argue that every artilleryman ought to be used to horses, every artillery corps ought to have sufficient 20- or 40-pounders, every man and Officer in those batteries should know thoroughly the use of horses and of those guns and how to move them, so that if we are attacked on any particular spot we shall be ready to meet that attack. I have been connected for twenty-seven years with infantry, cavalry, and artillery, and for the last fifteen years I have had the honour of holding a commission in the 3rd Middlesex Artillery, and Colonel Ray, who is present, will bear me out in my statement that I know something on this subject. What I say is this, that we should have guns of position, and that every artilleryman should know how to move them at any given moment. We should be so prepared that, like Captain Shaw, when there is a conflagration reported to him by telegraph, we should be able to go off at once and do our duty. If we are not prepared like that, we are not an army, and we are not prepared properly for the defence of our country. But what is the use of having a valuable property like the British Empire, unless the country will pay the necessary insurance, whatever it may be? We are always met by the word "Treasury!" The Treasury has nothing to do with it. Had the Volunteer Army been left entirely to themselves they would have proper organization and equipment instead of being placed entirely in the hands of a prejudiced school of officials that has said, "You shall never have field guns," because that is what it amounts to, and had it not been for indomitable patriotism, pluck, and endurance in good report and in evil report, we should never have been where we are now, but the whole force would have vanished. It is said that we are not capable of moving our guns, but I think if we can take 20-pounders and 40-pounders over ground such as at Portsmouth and round Portsea, we are capable of taking them anywhere. On the last occasion, when I was at Portsmouth, we took a road of our own, we rode across fields and we got into our position two hours before we were wanted. We were always up with our guns when we were wanted. What more do you want? If you want volunteer field batteries to present a fine appearance you must expend a great deal more money upon them. We don't say one word against the Royal Horse Artillery, or the Royal Artillery; we honour and admire them because we know the time, the trouble, and the expense that is required to make those Officers and men the perfect machines that they are. We, however, are so thoroughly handicapped that we are stopped from being field artillery and from having mounted work of any description. We have always been sat upon by the authorities. Yeomanry cavalry and field artillery seem to be a *bête noire* to them, and even guns of position, and they want to put us all on foot. We have often heard of organization schemes, beautifully rendered, as General Brackenbury has rendered his scheme to-day, but I do not believe in it. There can be no scheme large enough for us until every man in this country shall be prepared to defend the country in some branch of the Service. I would say if a man was not an efficient volunteer, or artilleryman, or did not belong to some branch of the fighting forces, then let us have a conscription on those men who will not do their duty. Let a certain number be taken and let those pay a certain sum of money to others to take their places, if they won't go into the fighting line themselves. I believe that many would support a volunteer field artillery, and would put the force into such a perfect condition that every



regular might leave the country and leave us to account for any enemy who landed on our shores.<sup>1</sup>

Major DOUGLAS JONES : At this late hour I will not say all I would like to on this important subject, but will confine my few remarks to my experience in Canada. When in that country I had the opportunity of observing the Canadian Militia, whose field artillery is second to no other arm in point of efficiency, and yet they only do, at most, 12 days' training every year. I have seen them with their 9-pounder guns manœuvre with fair precision, go past the Inspecting Officer at a trot, and even at a gallop, though of course I would not advocate such a proceeding. The guns are horsed by farm horses and ridden by farmers who at the end of their training perform very fair driving. I have seen them on field days go across country in an efficient manner and do very useful work indeed, taking up positions with celerity and with a good eye to ground. Now what Canadian farmers can do, surely we can do, and I hope a force of volunteer field artillery will soon be established.

Major THOMPSON : I will not say very much in reply at this late hour. One thing, however, I wish to say with reference to the remarks made by Colonel Richardson. I hardly agree with him as to my having applied a misnomer in calling this a paper upon volunteer field batteries. Before I was in the Horse Artillery, I myself belonged to what was known in India as a heavy field battery, recognized by Government as such. The word heavy field battery is quite as well known as light field battery, and it is perfectly correct to speak of volunteer field batteries, although the guns used could not be possibly lighter than the present Armstrong 20-pounder. I strongly object to guns of the huge type which are what Colonel Richardson evidently thinks the only things Volunteers should be allowed to have. I do not believe those guns would have sufficient mobility, and one great point as regards these batteries is that they should have some mobility. I never meant that they should not be able to leave the roads. One speaker evidently thought I intended that those batteries should never do so. My great point is that they should be able to do so when occasion arises, but as I said in my paper, really this country is so enclosed, that though you may be able to manœuvre your guns in all kinds of extraordinary places, as described by Colonel Shakespeare and Lord Wemyss, the greater part of the ground you cover will have to be roads, and the great point is that you should not be in the way of regular troops. The objection generally raised by the Royal Artillery to the Volunteers having field batteries has been that they would block up the roads, and therefore these batteries must have mobility enough to be able to get over the ground at a fair pace. The question of expense raised by Colonel Richardson is fully answered by what General Brackenbury has said. I spent half an hour this morning in trying to find out what the cost of a regular field battery really was, but I see he says it costs at least 30,000/<sup>2</sup> a year. That is quite a sufficient answer to the question of the possibility of increasing the Royal Artillery in this country, and it shows that if you are to have a larger reserve of regular artillery you have got to look to Volunteers, and to Volunteers only. It is perfectly impossible that you could keep up a sufficient force of regular artillery to meet the need that would arise if an invasion of this country were threatened. I am exceedingly glad to find that General Brackenbury has spoken so much in

<sup>1</sup> The Inspecting Officer of Artillery (Lieutenant-Colonel Bailey, R.A.) for the Home District wrote to Colonel Lord Truro, on 13th April, 1882, to convey to the corps under his command how much gratified he was by—1st. The strong muster of the 3rd Middlesex Artillery at Portsmouth Review, on the 10th instant. 2nd. The large number of guns horsed and brought into the field. 3rd. The appearance and discipline of the batteries and escorts. 4th. The hearty, zealous, and careful manner in which all ranks threw themselves into their work, and the way in which the 20-pounder and 40-pounder guns were handled and brought into action over difficult ground, were also deserving of the highest commendation.—G. T.

<sup>2</sup> Originally stated, but corrected to 13,000/.



favour of having volunteer field batteries. I think the speech that we have heard from him to-day is of the very greatest value and one we are all very glad to hear. I wish more attention had been paid to-day to the question of contracts with the farmers for their horses. It is all very well to say you can get those horses. We have had the experience of several Officers who have turned out on various occasions with volunteer field batteries, and no doubt you *can* get the horses; you can get them to-morrow, but would you be able to get them if some threatened invasion were before you? In the first place the horses would go up enormously in value. Under my system you would have the certainty that you could provide those horses at a certain cost, and you would be sure of having them. I do not think it at all follows that you will have those omnibus horses that the speakers alluded to, always ready. At any rate not when invasion threatens, and that is what I want to meet. I am exceedingly obliged to you for the attention I have received.

THE CHAIRMAN: In closing this discussion I think I shall be expressing the general feeling of the meeting that the paper which has been read this evening is one of great importance, and not only of great importance but I think most of those present will agree that the views expressed by Major Thompson have been expressed in a moderate and reasonable way, and not in any way which, as is very often the case when propositions are made, defeats itself by its extravagance. I may say that much because I think what Major Thompson has suggested is in great measure feasible and not beyond the resources of the country, and when I say the resources of the country, I mean not what the country can do, but what the country as represented by the Legislature is prepared to do. One is apt in a meeting of this sort to deal with these questions too much from an individual point of view, that is to say, purely professional. We have to consider not only what aspect it bears in a professional point of view, but also the aspect it bears in a political point of view, because we must remember we can do nothing unless the Houses of Parliament consent to adopt it; and therefore we have not merely to agree amongst ourselves or the Army generally, as to what is the best thing, but we must educate our masters to agree to it also. The reason I say this is because I think Major Thompson assumed the invasion to take place under the most unfavourable circumstances that could possibly happen for us: that is to say, two Army Corps were to be abroad, and the Navy was to be absent or defeated. I think practical politicians would tell you at once that they could hardly admit the possibility of a very grave invasion in force, while we had two Army Corps abroad on the Continent, because in the first place it is an understood thing that we should not embark in any enterprises on the Continent except in alliance with another great Power, for our two Army Corps would not be sufficient by themselves. There would then be three great Powers, two on one side at least and one on the other engaged, and we can hardly suppose such a disturbance will take place on the Continent without some of the other great Powers being more or less in benevolent neutrality towards us. There is only one Power which could invade us under those circumstances, not being engaged, that is France. If France joined with America, a thing which we trust is far distant, that would be a very formidable combination against England, because it would place our fleet in the worst position in which it could be placed. I only mention that because it is a thing to be assumed. I quite admit that for academical study it is right to assume it, but I do not think practical politicians will altogether endorse it. As to the point about the payment of the men when they came out for training, I think Colonel Hill was quite right in the view that he took, namely, that one shilling a day would neither be accepted, nor acceptable, that men of that class would rather come for nothing than receive one shilling. I think that is a weak point in Major Thompson's scheme. When we remember that the Yeomanry are paid 7s. a day, I think that shows nearly the estimate which must be made for payment. It would very materially increase the expense if we have to pay 6s. or 7s. a day. With regard to the Yeomanry we must remember that when they were put on their present footing and were paid on coming out for training they were a very small force—between 10,000 and 11,000 men; the number under training rarely reaches 11,000. That is a very different thing to 220,000, and I apprehend that had the Volunteer Force been in existence

at the time the Yeomanry were first called into being, the Yeomanry would have been paid but would have been put on the same footing as the Volunteers now are. I think Colonel Ray's mention of the artillery volunteers coming up to Shoebury-nese without payment is very *à propos* to the point. I mention these things because I feel that they are the things which swamp any scheme. No one who has studied public opinion can fail of being aware that at the present moment there is a very strong feeling in the House of Commons that the maximum of the Army Estimates has been reached. I do not say whether it is right or wrong, but one takes note of these things, and there is a very strong feeling in the House of Commons, just as much on one side as the other. I do not think it is a party question, but it is the general feeling. These things have to be noted, and of course the more you raise your estimates of the cost of these proposals, the greater is the difficulty thrown in the way of their adoption; and however much we may sympathize with the expression of one gentleman who addressed us that he did not care for the Treasury; yet still the Treasury have got the keys of the money, and unless we are prepared to turn burglars, we shall hardly get it without their consent. As regards mobility and the field-gun question, I would only suggest that if an invasion were attempted at all, it could only be attempted in very large force, and that a single battery, or two or three batteries, if there were so many in the neighbourhood, could not by themselves make a successful resistance. It is not the question of a few boats' crews, or of a cruiser coming along and sending boats' crews on shore to burn or plunder,—that is a very different thing,—but an invasion would be covered by a flotilla of gunboats and very powerful naval artillery which would sweep any such opposition altogether away. That is a practical military proposition which I think will not be denied. Nor could we afford to fritter away our units in that sort of way. What we should require would be to concentrate our positions in such force that we should hem in the enemy if they once made a landing, so that they could not advance without taking the positions we had prepared. We could not afford to lose a battle, and we should be obliged, therefore, to concentrate our forces in some advantageous position. It is no secret that positions have been selected around London to cover London from every possible point on which a landing could be made, and it is in that direction we should want the volunteer artillery,—we should want guns, and men men with those guns of position,—we should want them to go to the places prepared for them, and to occupy them and fight there. General Goodenough alluded to the bullock batteries in India, and of course any one will see that they were comparatively of small value. But the conditions would be very different: we should not be pursuing an enemy from one place to another,—it would be a very big business, and we should occupy defensive positions. As regards the guns, I quite agree it would be desirable to have lighter guns than 40-pounder guns. When you have 40-pounder guns the supply of the ammunition becomes a very much more serious matter, and when you have a very large force on a comparatively restricted front, the roads would get blocked to such an extent that everything you could do to diminish your transport would be desirable. I have no doubt the guns suggested by Major Thompson would be sufficient for all practical purposes. I will not now trespass longer on your time. I think I may assume that I may convey to Major Thompson the thanks of the meeting for his paper. I think we are equally bound to thank those gentlemen who have taken part in the discussion which you will all agree has been very interesting and I trust will bear good fruit.

Major THOMPSON: I should like to take the opportunity of saying one thing on two points that have been raised. I believe myself the Volunteers would not require the very large payment that has been supposed by some speakers. Speaking for myself, I am quite confident that a battery could be raised on the terms suggested in Table B.<sup>1</sup> I also want to call your attention to that one point about

<sup>1</sup> With regard to cost of volunteer field batteries, I wish to point out that even if the pay for the eight days be raised 3s. per head above what I have allowed in Table B to all ranks, it would only increase the estimate by 14,400*l.* for 100 batteries, and still leave the entire cost under 95,000*l.*

the guns belonging to particular corps and not to separate brigades, which have been advocated by some speakers. I think that for purposes of concentration it would be far better that you should have brigades of field artillery than that they should be isolated batteries belonging to garrison brigades. Moreover, my experience is that we can get men to join these batteries who will not join garrison ones.

General **ERSKINE** : Would you allow me as Chairman of the Institution to thank you, Sir, for taking the chair, and also to express the acknowledgments of the Council to the Secretary of State for War for having permitted the head of the Intelligence Department to come to this theatre and to make the very important statement to which we have listened this afternoon ?

Friday, April 29, 1887.

MAJOR-GENERAL W. H. GOODENOUGH, C.B., R.A., Inspector-General of Artillery, in the Chair.

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## ACCURACY OF ARTILLERY FIRE.

By Major G. MACKINLAY, R.A.

THE subject of good shooting has greatly occupied the attention of thoughtful Officers, and the improved matériel now at disposal demands much care in order that the greatest possible accuracy of fire may be attained. All authorities of all arms are agreed on the importance of this subject. Prince Kraft of Hohenlohe-Ingelfingen, after his experience in high command in the German Artillery during three great wars, writes that the principal requirement of good artillery may be expressed in one word thrice repeated; it must hit, hit, hit; to hitting belongs everything connected with correct handling, skilful observation, and careful correction of elevation; the mobility of artillery, absolutely necessary though it is, he considers to be of only secondary importance.

Lord Wolseley stated in his orders to the troops previous to the Ashantee War, with reference to general accuracy of fire: "Every shot that is not deliberately aimed not only encourages the enemy, who would soon learn to despise a fire that did them no injury, but it seriously affects the efficiency of the force: if ammunition were to run short, a stop would be put to our further advance."

Though all firing is essentially based on the same principles, a few features of artillery as distinguished from small-arm fire may be noticed in order that too much may not be expected from it on the one hand, or that it may not be unduly depreciated on the other hand. The advantage or facility of artillery fire is chiefly that the piece is held steadily on discharge, and it is consequently more easy to hit with an artillery gun than with a small-arm, as the latter must not only be aimed truly, but must be held steadily; it is also an advantage that the effects of artillery fire are visible at a greater distance than those of musketry, and thus the firing can be corrected; but the difficulties are numerous; several men have to co-operate in order to fire one piece in the artillery; the ranges are in general much greater and more difficult to find, and the importance of each individual round telling with effect is greater than with infantry fire, this is specially the case with the heaviest ordnance; but the chief hindrance in the attainment of accurate artillery fire is probably the small amount of annual practice ammunition, because of its expense and difficulties

connected with ranges. In horse and field artillery a *fair* amount of practice ammunition is annually fired, though four-gun batteries, with an equal number of men to be instructed, have only two-thirds of the ammunition allotted to others; and only motives of economy prevent a greater expenditure, which would doubtless give greater accuracy of fire. In siege artillery the practice firing is much less on account of increased expense; but this is not of such importance as appears at first sight, because such ordnance are fired with great deliberation at fixed targets, and the conditions are favourable to accuracy; nevertheless careful previous training is necessary in all the arrangements, but these can be rehearsed without the expenditure of a very large quantity of ammunition. When, however, we come to the heaviest land-service guns used by the garrison artillery in coast forts we meet with many difficulties; a large proportion of the guns can seldom be fired on account of danger to passing shipping, and their great expense very greatly limits the number of rounds allowed for practice, thus it is not easy to give sufficient training in the use of these weapons; on the other hand, the interests at stake are enormous, and the heavy guns of a coast fort may be directed against that most difficult target—an enemy's ship, moving at a much higher speed than any regiment of cavalry; and it may be of the utmost importance to strike her in a vital part and prevent her from running past the work; this demands great skill, as the shooting cannot so readily be corrected from observing the results of previous rounds as at sieges, because the ranges vary rapidly, and the opportunities are fleeting; we have had no practical need for the services of the artillery in the defence of our coasts for many years, but it is important that they should be able to maintain a rapid and accurate fire.

Fire discipline is just as much needed in the artillery as in the infantry; the elevation and length of fuze ordered by the Commanding Officer must be adhered to, and the fire of the guns must be directed on objects pointed out by him in order to obtain a concentrated fire and unity of action.

The utmost accuracy attainable should be sought for, but this requires constant effort; a certain measure of accuracy is easily reached, but any improvement involves labour; excellence is only obtained by those who will show an almost infinite capacity for taking trouble.

We will proceed to consider the subject in the following order:—

1. *Matériel.*
2. Range-finding.
3. Sights.
4. Training.

5. Correction of fire from observation of the effects of previous rounds.

#### 1. *Matériel.*

Progress in the accuracy of ordnance and ammunition has been considerable of late years, and may be said to be due to three causes—

- 1st. The introduction of rifled guns.

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FIG. 1.  
COMPARISON OF ACCURACY OF TRAJECTORIES  
OF 8-INCH R.M.L. HOWITZER.  
RANGE 1500 YARDS.

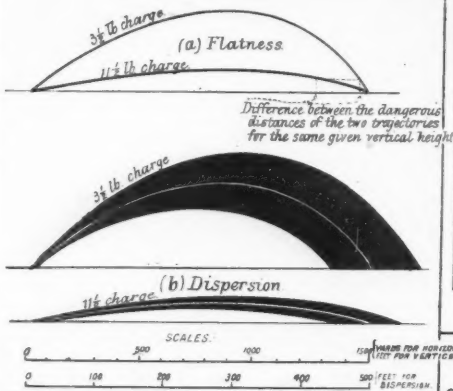
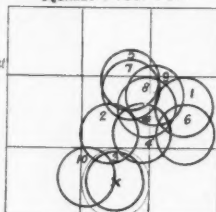


FIG. 2.  
DIAGRAM OF PRACTICE FROM  
9.2 INCH B.L. GUN.  
RANGE 1000 YDS. 10 ROUNDS.  
COMMON SHELL 320 LBS.  
CHARGE 140 LB. PRISM.  
SHOEBURYNNESS, 25TH APRIL, 1883.  
PART OF TARGET MARKED WITH  
SQUARES 1 FOOT SIDE.



COMPARISON OF A  
OF MARTINI-HENRY  
WOOLWICH, 25

MARTINI-HENRY

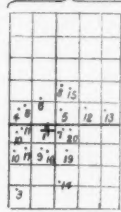


FIG. 8.

COMPARISON OF RESULTS  
OBTAINED AT PLYMOUTH IN 1879.

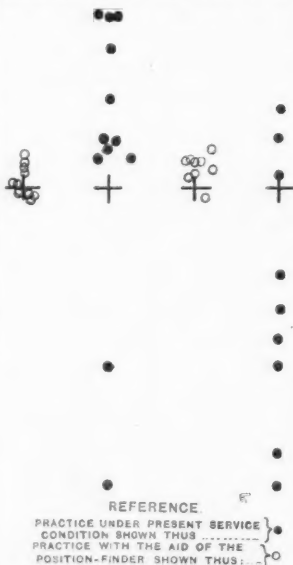
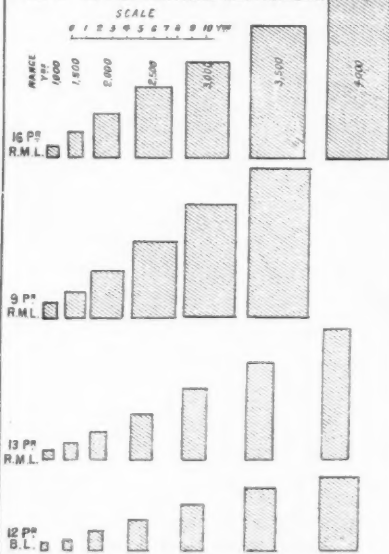
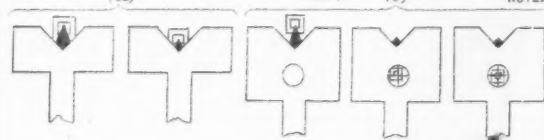


FIG. 5. 25 P.C. VERTICAL RECTANGLES.



(a)

FIG. 7. (b)



NOTE.—THE NOTCHES AND ROUND  
HOLES IN ALL THESE ROUGH  
SKETCHES ARE EXAGGERATED  
FOR THE SAKE OF SHOWING  
THE TARGET AND FORESIGHT  
DISTINCTLY. THE HOLES ARE  
REALLY ABOUT THE SIZE OF  
A PIN'S HEAD.

SHORT.  
FIG. 10.



FIG. 13.



FIG. 16.



Burst of shell s  
but no indicati  
of hits of fragm



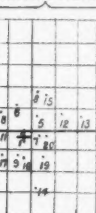


FIG. 3.

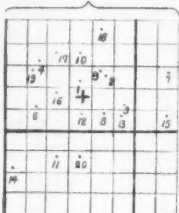
COMPARISON OF ACCURACY OF SHOOTING  
OF MARTINI-HENRY AND SNIDER RIFLES.

WOOLWICH. 22ND DECEMBER, 1884

MARTINI-HENRY



SNIDER



POINT OF MEAN IMPACT

POINT OF MEAN IMPACT

FIG. 4.

DIAGRAM OF PRACTICE AT A  
HORIZONTAL TARGET CARRIED  
OUT AT MEPPEN.

IN AUGUST 1879 FROM AN 11-INCH  
RIFLED HOWITZER. RANGE 7327 YDS.  
WEIGHT OF SHELL 476 LBS.

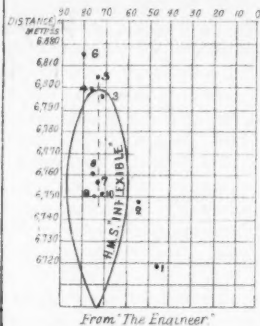


FIG. 8.

SCOTT'S REVOLVING SIGHT.

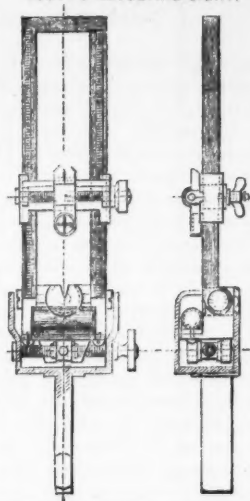
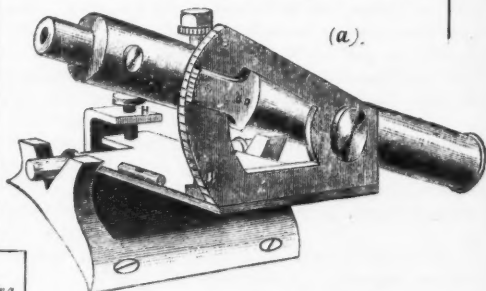


FIG. 9

SCOTT'S OVER BALANCE TELESCOPIC SIGHT.



(a).

SHORT.  
FIG. 10.



SHRAPNEL FIRE.

OVER  
FIG. 11.



RANGE.  
FIG. 12.



FIG. 13.

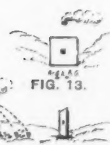


FIG. 14.

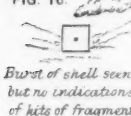


FIG. 15.



FIG. 16.

RESULTS UNCERTAIN.



(Burst of shell hidden from the firing point by folds of ground)

FIG. 17.

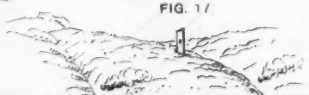
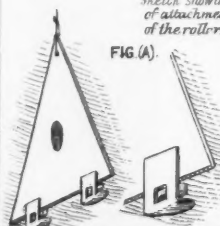
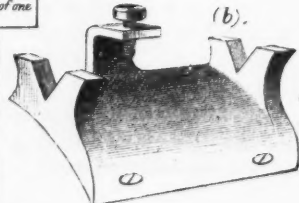


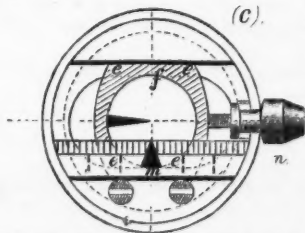
FIG. (A).



(b).



(c).



NOTE.—THE CONTENTS OF INNER CIRCLE M. E. F. REPRESENT ALL THAT CAN BE SEEN WHEN LOOKING THROUGH EYE-PIECE OF THE TELESCOPE; THE HEAD OF THE THUMBSCREW N IS OUTSIDE.



2nd. The sealing of windage either in a B.L. or by a gas-check in a M.L. gun.

3rd. The attainment of high velocity for guns, giving the advantage of a flat trajectory which aids so much in the attainment of accuracy, as not only is the dispersion less (compare diagrams of 8-inch howitzer (Fig. 1 (b)) fired with a large charge giving a comparatively flat trajectory (Fig. 1 (a)), and with a small charge giving a more bent curve), but the angle of descent being less, a target will be hit over a greater dangerous distance, and thus errors in estimating the range are rendered of less importance than would otherwise be the case; an incidental advantage of high velocity is that noticed by Colonel Maitland, R.A., in the Russo-Turkish war, when a Russian gun at Rustchuk was pointed out to him by the Turks as a particularly dangerous one, because the shell came before the warning sound of the firing of the piece; at other places where the guns had a lower velocity, the sound of their firing was heard before their shells came, the working parties of Turkish soldiers thus had good warning and had time to hide away under cover, hardly any damage was done, and the men did not fear the fire at all.

An example of good shooting of a modern high-velocity B.L. gun is given in Fig. 2 of a 9.2-inch gun fired at Shoeburyness in 1883, and laid by the experienced experimental Officer, Major O'Callaghan, R.A.

A fair comparison between the shooting of the Martini and that of the Snider is given on Fig. 3, which is the real size of parts of the target: the former rifle has the flatter trajectory, and the shot marks in its group of 20 rounds, fired from a fixed rest at 500 yards range, are seen to be close together, showing less dispersion or more accuracy than those of the Snider rifle fired on the same day under similar conditions.

With howitzers, however, it is sometimes essential to obtain a steep angle of descent in order to clear a projecting mass and breach an unseen and covered escarp, or to send a shell with a large bursting charge against an earthwork so that it will penetrate and explode in it and not ricochet off and waste its effect elsewhere; in these cases recourse must be had to a very bent trajectory, in which case, though the accuracy can never be so great as with the direct fire of guns, yet it is sufficiently so to obtain the desired effect without the employment of an excessive amount of ammunition. Another application of this nature of fire is at the decks of ships at very long ranges from large howitzers with considerable angles of descent to prevent ricochet: Krupp obtained the results shown in Fig. 4 at Meppen as long ago as August, 1879, and much interest was excited, as the descending shell of such a piece would crash through the deck of any vessel with most destructive effects; very good results were obtained last year in Russia, when an 11-inch B.L. mortar on slides inclined at  $35^{\circ}$  fired a 600-lb. shell at a range 7,500 yards with lateral errors of 15 to 30 feet, and longitudinal errors from 63 to 126 feet; Italy has adopted this nature of coast defence; steps have been taken to obtain this description of fire in our Service, and good results have been obtained

at Shoeburyness at a very long range. Commander Lindsay, R.N., and Lieutenant Stokes-Rees, R.N., H.M.S. "Cambridge," point out in a letter received this morning, that in order that this nature of fire may be effective the range must be accurately known, and large allowance must be made for the speed of the enemy, as the time of flight of the shell must necessarily be long; this is doubtless true, and it will render the value of this fire much less than would appear from practice at fixed targets, but if one shell in twenty or thirty strikes the deck of a large ship the expenditure of ammunition will probably be well worth the result.

The progress in accuracy of recent field guns is shown in Fig. 5, in which the relative sizes of the vertical targets which would be struck by 25 per cent. of the rounds fired at various ranges are drawn to scale from information given in the range tables; it is there seen that the 9-pr. R.M.L. gun is very deficient in accuracy; and it is hardly too much to say that one 12-pr. B.L. battery could generally produce at least as good an effect as two batteries of 9-pr. guns; it would appear to be a matter of great importance to replace the 9-pr. guns as soon as possible by more accurate pieces, especially in India, where the Russian Officers present at the Delhi Camp of Exercise in the cold weather of 1884-85 remarked unreservedly on the inferiority of the armament of the mounted artillery, while they praised the magnificent turnout of the batteries and the good physique of both men and horses; a 9-pr. battery is just as expensive to keep up as a 12-pr. one. These diagrams do not tell all the difference which exists between the guns, as they are compiled from practice with similar sights at Shoeburyness, and no account is taken of the more accurate Service sight of the 12-pr. B.L.; the newer pieces also hit harder and have flatter trajectories than the older ones because their shells have higher velocity, and thus their shrapnel fire is more effective at all ranges; there is consequently an increased probability of hitting with the bullets of the newest type guns. The bullets also ricochet better than those from the shells of the older pieces, because the angle of descent is smaller and the velocity higher, hence a greater distance is swept than before; the steel shrapnel shells of the newer pieces also contain many more bullets than the cast-iron shells of the old type guns, as shown by the annexed—

Table A.

Gun.	Weight of gun.	Weight of charge.		Muzzle velocity.	Number and weight of shrapnel bullets.	Total number of shrapnel bullets.	Remarks.
	cwts.	lbs.	oz.	f.s.			
9-pr.	6	1	12	1,390	{ 28 of 18 to the pound 35 of 84 to the pound }	63	{ Old type R.M.L. gun. Cast-iron shells.
16-pr.	12	3	0	1,355	{ 72 of 18 to the pound 56 of 84 to the pound }	128	{ Old type R.M.L., heavy field gun. Cast-iron shells.
13-pr.	8	3	2	1,560	{ 133 of 34 to the pound 177 of 35 to the pound }	133	{ New type R.M.L. gun. Steel shells.
12-pr.	7	4	0	1,710	{ 177 of 35 to the pound }	177	{ Newest type B.L. gun. Steel shells.

It would be well, as soon as possible, to get rid of the complication and confusion only too likely to arise on active service from the various kinds of ammunition required for the four different guns which we have at present for our small force of horse and field artillery—reduced just recently; it appears to be a most important matter to shorten the transition period through which we are now passing, and to arm the whole of our mounted artillery with the new 12-pr. B.L. and with a heavy new type field gun. The R.M.L. 9- and 16-pr. should be relegated to such duties as the auxiliary armament of coast defences for which they are well adapted for short ranges; the 13-pr. gun will probably soon disappear from our Service.

There are many other points connected with guns and ammunition which have an important influence on accuracy; they are uniformity of powder, uniformity of weights of projectiles and charges, a proper distribution of the mass of the projectile, the twist of rifling, a worn bore, the method of mounting, and accurate time fuzes, which will keep well in all climates, are a great desideratum. Progress has been made in many of these directions, but much remains to be done.

## 2. Range-finding.

A cause of inaccuracy on active service is that the *range* is often *unknown*; it must either be found by some instrument, which is liable to cause delay, or it must be guessed; in both cases the firing should, when possible, be corrected by noting the effects of trial rounds, generally with percussion fuzes; this becomes increasingly difficult to do at long ranges, where the effects of fire cannot readily be distinguished, even with the aid of a field-glass.

For a long time it seemed doubtful if range-finders would find a

permanent place in our field service; some Officers reported favourably, while others again found little good in them; but improvements having been made, in cheapness and portability, and more experience in their use having been gained, they are now firmly established in our own and in Continental armies, and they doubtless greatly conduce to accuracy of shooting under certain circumstances. On the strong recommendation of the Committee on Range-finders, a School of Instruction has been established at Aldershot, with a definite course, and thorough practice in the use of the Watkin instrument, as it appeared that its use was seldom properly understood, and even when that was the case the necessary facility, only developed by constant practice, was not attained. The Committee justly represented that as careful training is required to make army signallers, where those at each end of a range are trying their best to understand each other, so regular training is also necessary in range-finding, where the enemy's constant effort is to conceal what the observer wishes to find out. Care in the use and keeping of these instruments must be insisted on, as sometimes those who use them do not consider that a range-finder should be handled more carefully than a sword or a rammer.

All the systems of range-finding are based upon the principles of surveying, with the exception of the plan for finding the range by the velocity of sound, but this is very inaccurate, and it has the disadvantage that it cannot be employed until the enemy has commenced firing.

The necessary conditions are that ranges must be found with a fair approach to accuracy to be of any real value, say within 1 per cent.: this can be done with comparative ease at a short range, but it is generally more difficult to do so at a longer one, when also *any* error is of more importance in affecting the accuracy of shooting as the trajectory becomes more curved with increased dispersion and increased angle of descent and decreased dangerous distance (Fig. 1 (a)). On the other hand, more time can generally be given to find the longer ranges, and greater care should always then be taken.

All range-finding may practically be defined as the measurement of an unknown distance in the terms of a known one called the base: thus, when finding the distance of the earth from the sun in 1882, at the transit of Venus, a base line nearly the length of the diameter of the earth was employed; the result obtained was supposed to be accurate within about 0.12 per cent., and the ratio of base to unknown distance was about 1 to 12,000. For military range-finding the ratio of base to range should not generally be less than about 1 to 20, but it may be considerably increased if a telescope is used: the shorter the base the more quickly can a range be found, but the longer the base the greater will be the accuracy, if other conditions are the same.

Some instruments contain their own bases; they are very quick and simple in their action, and they will give good results at the shorter ranges, but they fail in accuracy at the longer ones, when the variation in the angle subtended by the base becomes too small for



accurate measurement. An exception may perhaps be made in favour of the Berdan range-finder, as it has a base line of 6 feet with well mounted telescopes at each end, but it is very expensive and awkward to transport; Mallock's range-finder on this principle may perhaps be found useful. The fixed base takes no advantage of the circumstance that a longer base can generally be advantageously employed in finding the longer ranges.

Other instruments, such as Weldon's, are arranged to take a fixed ratio between base and range, and consequently about the same percentage of accuracy is obtained at all ranges: this system has the advantage of simplicity, and is specially convenient at short ranges, but it does not readily lend itself to the circumstances which arise, as it may happen on rough ground that it is not possible to obtain the exact length of base desired, and then the range cannot be found at all.

The systems which have given best results under *all* circumstances are those which adapt themselves to the various conditions which may arise, allowing a fairly constant ratio of base to range.

Turning to the records of active service, when range-finders have been used by our troops in the field, no very satisfactory results have yet been obtained; this may perhaps be explained by the difficulties which then existed connected with the want of proper training of the observers, and the rough usage sustained by the instruments *en route* to wars, where difficulties of transport were very great; but with the lately organized system of annual inspection, periodical return of the range-finders to headquarters, and careful training of the observers in the care and employment of the instrument, the field range-finding system will now have a fair trial, and will probably give good results.

Ranges will be found at sieges by the accurate but somewhat bulky Nolan range-finder. For elevated coast defences it has been customary for many years to find the range of an enemy's ship from the battery by measuring the angle of depression to the water line of the vessel, but Major Watkin has reduced this well-known principle to a most useful and practical application in his depression range-finder, especially when it is combined with his position or direction-finding arrangement. The instrument is placed on a firmly set, well-levell'd stone, isolated from the flooring to prevent vibration (as is usual with astronomical instruments), and it is in an observing station, at such a distance from the battery as to be clear of the smoke of the guns. When an observer keeps the cross-wires of the telescope of the instrument on the water line of a moving ship, the range is automatically indicated with such readiness that the probable position of the vessel some seconds in advance can be predicted, and an ingenious electrical arrangement connecting the instrument at the observing station with the battery causes dials at each group of guns automatically to record the ranges and directions of the ship from the guns; these will be different from the ranges and directions from the observing station itself. The guns can then be fired after certain scales at them have been adjusted corresponding to the indications on the dials, and accurate shooting can be carried out though the

enemy's ship may be hidden by smoke from the men actually working the guns. Fig. 6 shows results obtained by guessing the ranges and using the ordinary sights compared with those obtained by the use of the range- and position-finder; buoys fixed at known ranges will also be used to assist in range-finding from forts.

The recent adoption of range- and position-finding and of submarine mining have greatly increased the power of coast defence, and all that now seems required is a proper training and a skilful organization of the powerful means placed at our disposal.

With ships, on the other hand, I understand, a *good* range-finder is much required. An Officer sent aloft can find the angle between the water line of an enemy's ship and the horizon, and hence the range by aid of a sextant, but the steadiness of the instrument on land, which conduces so much to its accuracy, is entirely wanting, time is lost in communicating from aloft to the deck, and when a ship fires at a fort the horizon will not be visible in its direction, but in that case the range is found by cross bearings and reference to the chart. It is possible that range-observing stations might be fitted up at each end of a ship, and thus its length might form a base, but this would present several difficulties. At the present time I believe some Officers consider it necessary that a ship should anchor for accurate fire at a fort, or else it should only fire as it passes some buoy dropped at a known distance from the hostile work; the movement of the waves renders the platform from which a ship's gun is fired unsteady, and it therefore tends to impair the accuracy of fire; naval shooting also suffers under the disadvantages that, unlike that from coast forts, it cannot continue when smoke obscures the view from the guns. At Alexandria one of the attacking ships (Admiral Le Hunte Ward's) found that more rounds could be delivered with accuracy in a given time with salvoes of four guns than when firing independently, as it was then easier to steam clear of the smoke, and aim could be taken again more easily; but I trust some naval Officers will inform us how an accurate fire is best obtained from ships.

With regard to estimating ranges by eye: distances over a level surface are generally under-estimated, and those over undulating ground are often judged to be further off than they really are. Light is often very misleading; for instance, a distant object to the west at sunrise is strongly illuminated, seems very distinct, and is judged to be nearer than it really is; but in the evening the object, as seen from the same spot, appears under the sun, is indistinct, and looks much more distant. In the French night attack on Sfax, the ships lighted up the enemy's position with the electric light; their boats advancing and firing in the dark had a good object to aim at; but they were themselves difficult to see, and consequently to hit.

When the range has been estimated, whether from the indications of a range-finder or simply by judging the distance by eye, it is most essential that it should be verified, and the shooting corrected if necessary from careful observation of the results of fire, as will be considered under the fifth heading.

### 3. Sights.

It is admitted by most Officers that a great part of the Service sights are not sufficiently accurate for the guns they are employed with. The line of sight is obtained by aligning two marks connected with the gun on to the target; the movable sight is generally that at the breech, and it is provided with a notch, the other fore sight is an apex point. In order to lay properly it is necessary to obtain a full sight (Fig. 7 (a)), *i.e.*, the shoulders of the tangent scale should appear to be in the same horizontal line as the apex of the fore sight and the centre of the target. If a fine sight is taken, the elevation is less than is intended, and the projectile will probably fall short. The Royal Navy, however, use a half sight, and their range tables are calculated accordingly. Sometimes the notch is deep, for facility of laying, but a *shallow* notch is employed for accurate siege fire. The objections to this plan are, a certain difficulty in bringing the fore sight and target into the same horizontal with the shoulder of the tangent scale, and this becomes more troublesome to do as the depth of the notch increases; a part of the target (especially if it is a retiring one) is hidden by the sight; the aiming will not be exactly the same on a cloudy day as when the sun shines brightly with a strong glare, even though the sights are purposely kept dull; and it is not easy for the eye to focus the two sights which are near at hand and the distant target at the same instant; hence various plans have been suggested; in a French tangent sight the notch is replaced by a sort of crescent, which allows the target to be well in view between its pointed horns; in our Service rifles the notch has been given up, and a straight-edged back sight provided with a vertical line on it is used instead; a somewhat similar plan is adopted in the naval 6-inch B.L. gun, in which the tangent sight is provided with a straight horizontal wire; a vertical pointer below indicates where the notch would have been; this arrangement allows the target to be well in view.

Endeavours have been made with the 12-pr. B.L. and 2.5-inch jointed gun to avoid the effects of glare and the focussing difficulties, by the use of cross-wires in a hooded fore sight and a pin-hole in the tangent sight (Fig. 7 (b)), the last arrangement being on the principle of the orthoptic sight used with rifles; the cross-wires being in a tunnel or hood, are always in the shade, glare is thus avoided, as they are well protected they are not liable to be broken, and if they are they can readily be replaced, and the target is but little hidden by them. The pin-hole enables the fore sight and the target to be sharply focussed by the eye at the same instant, on the principle of the small stop used by a photographer when he wishes to focus a near and a distant object at the same time, and it is easy to make the intersection of the cross-wires in the fore sight cover the desired spot on the target. As only a small field is taken in by the pin-hole, it is necessary first of all to use the ordinary sights for rough laying, on the principle of the finder attached to large astronomical telescopes, but this is readily done when time for

accurate laying is allowable. An orthoptic disc,<sup>1</sup> similar to that employed for rifle shooting, is used in Major Owen Hay's battery of 16-prs., which only have the old pattern sights.

A simple illustration of the principle involved may be made thus: shut one eye, look at any distant object with the other, and hold up a hand so that the top of finger is in the same line, bring the finger so close that it cannot be seen distinctly at the same instant as the distant object; now take a card with a small pin-hole in it, and look through it at the distant object and at the finger, which should not have been moved; though not so bright as before, both objects may now be seen with distinctness at the same instant, proving that the eye can focus both together by this arrangement.

When the wheels of a field gun are at a different level, one sight is more turned sideways than the other, and the projectile will fall to the side of the lowest wheel unless suitable allowance is made, dependent on a somewhat troublesome calculation. The same effect has been caused in the jointed 2·5-inch mountain gun when the junction nut has been over-screwed. In the 12-pr. B.L. Major Scott's revolving sight (Fig. 8) automatically obviates the necessity for calculating this correction, as a small screw at the side will always restore the sight to its proper inclination as indicated by an attached cross spirit level; Scott's sight has given good results, it is to be largely supplied to field guns in England, and a high authority has applied that they should be fitted to every battery sent to India. A new reciprocating sight on the same principle has been made for the 2·5-inch gun; in this case the sight bracket revolves, and is levelled by a cross level. Lateral errors of fire, noted by the observation of the effect of rounds, can also be corrected without calculation by these sights.

Deflection is not generally given for the drift of rifled projectiles, but the tangent scale is put in at an incline laterally to give an average allowance for its effects, but at long ranges it will be necessary to give further correction by the deflection leaf. No good rule exists for the necessary correction to be given for cross wind; the formulæ are complicated and not very satisfactory. It would be well to have a good wind-gauge at coast forts, as although the wind will not probably always be the same down the range as at the firing point, a wind-gauge will be more accurate than mere guess work. Mr. Brodigan, of Dublin, is constructing a sight to take the wind and other causes for deflection into account in a systematic manner without calculation, and it may become practically useful; these matters connected with deflection have not hitherto attracted much attention, as it is generally easy to correct after one round; getting the range, on the other hand, is much more difficult by observation of a round from the firing point on account of foreshortening due to perspective. When firing, however, at a rapidly moving ship, the deflection must be carefully attended to, and it is not easy to correct for the next round from observation, as the

<sup>1</sup> Made by Mr. J. H. Steward, Optician, 406, Strand, London.

range and conditions vary. An effort has been made to obtain the deflection automatically in the naval "speed sights;" in any case, however, it seems important that the deflection should be given as correctly as possible for the first round.

Considerable progress has been made in the methods of laying at sieges; reflecting sights are employed, so that the No. 1 may be under cover whilst laying, and various devices have been adopted, chief among which may be mentioned Colonel French's sights, which are employed for firing at hidden targets, when the shooting should be corrected by signals from a flanking party who can see the results of the fire.

Telescopic sights have been advocated for many years, though they have generally been objected to on the score of liability to get out of order, but Scott's over-balance telescopic sight (Fig. 9) on the same principle of adjustment with a cross level as his other sight, has been tried in horse and field artillery batteries with very satisfactory results, giving greatly increased accuracy of fire. An objection to it is that it will be damaged if accidentally left on the piece when fired; but the guns are also provided with sets of ordinary sights as usual. The telescopic sight will probably be indispensable for those heavier guns which are laid by their own sights; accurate fire is much needed for them, and the sights will be less liable to damage than when constantly carried about by mounted artillery. Several Officers object to the fact that in the present construction of Scott's telescopic sight the V's bearing the pivots are too close together (Fig. 9 (b)) so that any grit or burr upon one of them will have a great effect on the sight, whereas a burr of the same size will have a less effect on the ordinary sights, as they are placed at a much greater distance from each other. There is doubtless ground for this objection, since in the astronomical transit instrument, which is also mounted on pivots resting in V's, it is well known that accuracy is obtained by putting the V's as far apart as possible and making them of considerable diameter; Scott's telescopic sight is, however, no doubt a most useful and practical one.

With regard to a telescopic sight for a machine-gun at a siege, General Gordon wrote in his diary 4th December, 1884, only a few days before the end of the siege of Khartoum, "With a good mitrail-leuse and a sharp operator *with telescopic sight* no gun could be served with impunity at 2,000 yards range, though *it* could be served against artillery fire, for at that range there is plenty of time to dodge under cover after seeing the flash ere the shell arrives."

A minor use of a telescopic sight has been noticed by Major Marshall, R.H.A., when it is used for instructional purposes. A man lays a gun with the ordinary sight, as he thinks correctly, but when he looks through the telescope he himself finds he has made some error; he would not of necessity have been convinced of his mistake if he had been simply told so by an instructor, hence more interest is awakened and the ordinary sights are used with greater care; this leads us to the next heading of—

#### 4. *Training.*

Almost any man can be trained to lay a gun with fair accuracy at a fixed target, but only a few can do so with rapidity, and the necessary facility can only be maintained by constant practice. Aiming drill is apt to become monotonous, and if a man once loses interest in his work he will not make much progress; hence every effort should be made to interest the men in aiming, on account of its great importance. In this connection, I trust I may be allowed to mention that I had the honour of receiving a private letter a few days ago from General Sir Frederick Roberts, in which he laid stress on the necessity for devoting much time to training in laying guns, and he dwelt on the need of using sights handily and properly. Some of the aids to training in accurate laying are—

(1.) Recruits should have careful aiming and firing with carbines, as this accustoms the eye to using sights. I have myself had to teach gun drill to squads of infantry soldiers in India, and the readiness and accuracy with which the laying was performed was remarkable. This was doubtless due to their previous musketry instruction.

(2.) The instructional target is useful; rivalry and interest may be kept up if the time for each man to adjust the small target three times is taken for a measure of his rapidity in laying, and the size of the corresponding triangle is systematically recorded as a test for his accuracy. A small instructional target may also be employed (as in A/A R.H.A.) to denote the position of burst of a shell; if it is placed much to one side of the target, training can be given in finding the necessary amount of deflection.

(3.) The rifle barrel attachment to a gun on the principle of Morris's tube gives variety and interest. Aim is taken with the ordinary sights of the gun at a distant object, and the rifle barrel is fired: some part of a near target will then be struck; if the aim has been good the bullet will strike an indicated mark upon it. The advantage of this plan is that direct evidence is given of the accuracy of aim by the striking of the bullets; it is a cheap substitute for the actual firing of the guns themselves; according to the testimony of Sir Frederick Roberts, Morris' tubes have worked wonders in training infantry soldiers in rifle shooting; doubtless some adaptation of the same sort to guns cannot fail to be of advantage to gunners, from the mere fact that it will induce men to lay accurately, and to use their sights intelligently. (Mr. Morris then exhibited his apparatus, explained it, and fired a small bullet from a tube such as would be fitted in a 5-inch B.L. gun at a target through an open door in an adjoining room.)

(4.) The use of good guns and matériel greatly encourages all to take an interest in shooting; on the other hand, Officers of batteries of the older guns sometimes find it difficult to interest their men when they know that their pieces are not the best.

(5.) The system of giving prizes for good shooting at the annual practice adds to the interest of the men, but it decreases the amount of ammunition available for the battery practice; the competitive



practice might perhaps be carried out with smaller guns and cheaper ammunition than at present; this would enable more rounds to be devoted to the regular practice of the battery.

(6.) The more practice there is with the guns themselves the better. The number of rounds of heavy guns fired in the garrison artillery is small—much less than in the Royal Navy; those who have had considerable experience in firing are the foremost to acknowledge its great use in training; thus a well-known gunnery Officer in the Royal Navy, Commander May, now commanding H.M.S. "Condor," writes in a letter just received from Malta, "Practice! Practice! Practice! actual shooting is the real thing, with an *accurate* record of results." The advantage of constant actual practice is well shown by the fact that the Officers in charge of experiments at Shoeburyness have always been splendid shots, due doubtless in great measure to their experience in laying and firing; a *large* floating target is now employed in the Royal Navy and only hits are scored, formerly a smaller target was used, but it was thought that sometimes rather too favourable estimates were made of the distances over or short of those rounds which did not hit.

(7.) It need hardly be said that the interest in shooting of a battery, and its efficiency and accuracy of fire, depend upon its Officers. Might not some valued recognition of shooting be instituted? Say a challenge trophy to be held annually by the best shooting battery which has made the most intelligent use of its fire, the trophy to be kept in the Officers' mess till another battery wins in a succeeding year; it might be held alternately, one year by field or horse, and the next year by garrison artillery; it is generally found that when any award depends upon the result of an exercise that it is carried out more thoroughly and with more exactness than when little notice is taken of the result; witness the care bestowed on the training for the annual competition at the military tournament.

(8.) Accuracy can only be attained by a careful attention to such matters as uniformity in the weights of the charges and projectiles. This point demands attention with filled shell; with M.L. guns care must be taken that all projectiles are rammed to the same distance.

Constant firing practice at one fixed target is uninstructional. After the range has been found and verified, only a small group should be fired; another target should then be selected, and its range should be found and tested. Practice at moving targets is most necessary in the garrison artillery, and steam launches should be employed to tug a target at high speed in a tideway; this firing is difficult, and Officers, both in the Royal Navy and in the Royal Artillery, who have devoted much attention to it are the most ready to acknowledge that great skill is required. Some plan or general idea should be formed when battery practice is carried out; it will give interest to it, and will be suggestive of what may occur on active service; for instance, in the garrison artillery so many guns should be told off to hit targets towed at speed, representing an enemy's ships trying to run the gauntlet, a gun or so in the fort should be put out



of action on the supposition that it is struck by an enemy's shell, and several of the men might be withdrawn during the exercise under the idea that they are wounded; the firing should, however, be carried on accurately, and without confusion or delay.

Coming now to larger questions of training, considerable advance has been made of late years. Formerly India had an advantage over England in having land ranges available at most stations for horse, field, and garrison artillery, while it was often difficult to find a suitable range at a home station; but of late years excellent arrangements have been made at the practice camps at Hay and Okehampton, where special attention is devoted to the development of accurate field artillery fire. Twelve batteries of horse and field artillery will carry out their full practice at those camps this year, and it is believed that Officers will be attached from other batteries for instruction. A portion of the garrison artillery has during the past few years had valuable training for a few weeks each year at Chatham in siege works and practical firing at Lydd; six batteries will take part this year. The progress in firing garrison guns from coast forts, however, has not been great; but progress will probably soon be made when the Watkin range- and position-finders are generally used. Shoeburyness, excellent as it is, does not fulfil all the requirements of the garrison artillery, for it is a place devoted to experiments in matériel, and endeavours are made to teach *all* artillery drills and exercises there, so that the special duties of the batteries of garrison artillery do not receive very full attention, nor can they in a place which is not a fort, and which is not a part of the regular system of the coast defence of a harbour or estuary. Colonel Lyons, R.A., has suggested the formation of a summer camp, which seems very desirable, for the garrison artillery, at the western forts, Isle of Wight, to which garrison batteries might be sent in turn for organized practice, on the system of the present camps at Hay, Okehampton, and Lydd; the garrison artillery would then have the opportunity of firing at targets moving in a rapid tideway from forts which form part of the defence of the Solent, and valuable training could be carried out in the combined action of several forts under one Commanding Officer, and the organization could be tested. Coast defence has attracted much attention of late, and the need for the combined action of artillery, submarine mines, and torpedo-boats is now apparent; it is believed that combined practice will take place this year from several batteries at Devonport.

The efficient and accurate working of heavy guns has also been thought out by Colonel Oldfield, R.A., when in command of the Royal Artillery at Malta; he caused a book to be compiled for each district, showing the position of the magazines, number of rounds for each piece, bearing of the guns, support afforded by the fire of neighbouring works, &c.; he also insisted on arranging all the store-rooms on the same plan, so that any R.A. Officer in Malta would know where to find anything on first entering a fresh fort: at a time when local knowledge is insisted on as a desideratum in Officers engaged in coast

defence, it seems advisable to simplify and classify as clearly as possible all the arrangements of the forts themselves.

5. *Corrections of Fire from Observation of the Effects of Previous Rounds.*

Telescopes or field-glasses are indispensable for making good artillery practice, except at the shorter and decisive ranges. General Gordon remarked in his diary, "Certainly every fortified place ought to be provided with a hundred good telescopes." The eye should be trained to observe, and the mind to understand the meaning of various often minute distant appearances after firing; thus the practised artilleryman knows that a cloud of smoke from a bursting shell on impact hiding any part of his target, indicates that a shell has burst short (Fig. 10), and when firing at an escarp wall hidden by a covering glacis, if a flattened cloud of smoke slowly rises and fragments of masonry are seen to fly into the air, he knows that the unseen wall has been hit low down.

The hiding of these indications from any cause will prevent an accurate fire from being attained; for instance, when firing from machine-guns at a long range at the bombardment of Alexandria, the splashes of the bullets could not be distinguished in the broken water near the shore, and there was no means of knowing whether the correct range had been obtained. Again, if a target is on the top of a hill (Fig. 17) the cloud of smoke of a trial shell may easily be hidden if it falls into the valley on either side of it, and it is then most difficult to correct the elevation.

It is evident that difficulties may arise with trial shots, and this is more particularly the case at the longer ranges, when the result of firing can hardly be seen; this has led to the adoption of flanking parties when possible, pushed well forward to some position where the result of the firing can be seen and signalled to those at the guns; this is absolutely necessary at sieges when the object fired at will often be invisible from the firing point, and cases will arise on field service when it can be advantageously employed.

The following is the approved method of finding the range by trial shots:—First estimate the range, and then fire a shell with 200 or 300 yards less elevation with percussion fuze to burst on impact and a little to windward of the line of fire, so that the smoke of the bursting shell may be blown across the range; if, as is expected, the shell strikes and bursts short, as indicated by the smoke of the shell obscuring the target (Fig. 10), fire the next round also with a percussion fuze with say 400 yards more elevation—a bold difference from the previous round; obtain a burst *over* as indicated by the target standing out of a background of smoke produced on the bursting of the shell (Fig. 11); then, in imagination, construct a zone to include the target, the outer lines being at right angles to the line of fire and at the distances of the points of impact of the two shells from the gun (Fig. 12). As the difference of elevation for the two rounds corresponded to 400 yards, it may be assumed that the zone is about 400

yards wide; consider by estimation, having regard to perspective and the lie of the ground, the position of the target with relation to the two sides of the zone, we will suppose it is judged to be at a relative distance of 1 from the further burst and 3 from the nearer one; this would mean that the first shell was 300 yards short, and the second one was 100 yards over. A third shell should be fired (Fig. 12), but the firing should also be tested by others with percussion fuzes if possible; shrapnel shell with time-fuzes may then be fired to burst in the air, but it is generally useless to begin with shrapnel and time-fuzes, as a shell which appears to burst in the air short of the target may really be a long way beyond it (Fig. 16). However, under the conditions of a very short range or when firing over water or hard ground, when the splashes or dust raised by the bullets and fragments of a shell can be seen, the firing can be corrected from observation of shrapnel with time-fuzes (Figs. 13, 14, and 15, each of which represents the target as seen from the gun, and also from the position of the range party). Colonel Nicholson, R.A., Commandant of the School of Gunnery, Shoeburyness, has studied shrapnel shell fire in a most practical manner, and has recorded the results. As previously noted, increase of velocity in modern guns increases the efficiency of shrapnel to a great extent, but the adjustment of the time-fuze, which is always a troublesome matter, is rendered rather less accurate.

A broad question of tactics comes before us, as to whether horse and field artillery should advance to a comparatively short range before beginning to fire, or whether they should commence at a longer distance. Some Officers advocate the shorter range from the success of the bold measures taken by the German artillery in their war with France, but a blind following of the letter of that which led to success in the past is not always wise, particularly as in the case before us accuracy of fire has increased with the adoption of range-finding and high-velocity guns, and the efficiency of infantry fire will increase with the general adoption of small-bores and magazine rifles. Of course the artillery should be brought up and employed at the very beginning of an action, and towards the decisive periods of the fight they must engage at a short range; but the question is, at what range should they generally begin to open fire? This paper does not, however, propose to go into field artillery tactics—but this question comes up, because if field guns are *never* to fire at a long range it is of no use to teach the men to fire in that manner. Long-range artillery fire has always the advantage that it can be carried on with deliberation, and it can be employed out of range of infantry and machine-gun fire, but unless conducted with great care it leads to waste of ammunition, and in many cases when folds of the ground intervene and the effects of fire cannot be noted (Fig. 17), it will be very difficult to attain satisfactory results. Over the sea, however, from coast batteries it is probable that very long ranges will be employed, for a very accurate range-finder can be used from a carefully prepared position, and the splash in the level water, which can generally be seen, indicates whether the shell has struck over or

short. Ships will also probably fire at fairly long ranges, being then beyond the range of torpedo action.

Provision is made to indicate the necessary alterations in the elevation, to alter the range, or change the height of impact on a vertical target at any range in the more modern range tables (see Table B); and it is fully recognized that range tables are not infallible, but are only to be regarded as indications or guides, as the conditions of fire may differ from those under which the data were obtained for their compilation; for instance, if a range is known to be 1,500 yards, and the elevation is given correctly according to the table, if several projectiles average 120 yards over, it would be folly not to lessen the elevation and also to make a corresponding deduction at all other ranges, because it is evident that the powder is stronger than is expected, or some other cause is at work to increase the range.

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The subject of accuracy of artillery fire is a wide one, but I believe the points most needing attention are the following:—The immediate introduction of new type high-velocity field guns, one of them to throw a heavy projectile, and the rapid withdrawal of the present 9- and 16-pr. R.M.L. guns; sustained training in range-finding for both field and coast firing; further improvements in sights; the use of the rifle attachment to train in aiming; further organization in the firing of the garrison artillery, especially at moving targets; more rounds to be fired annually by them; and the establishment of an annual practice for the combined action of garrison artillery with submarine mining and torpedo-boats in the defence of a harbour or estuary; further development of the system of observing and signalling the result of fire from advanced flanking parties to the firing point; and the establishment of a valued challenge trophy to be held annually by the battery which makes the most intelligent use of its annual allowance of ammunition.

The CHAIRMAN (General Goodenough, R.A.): I may state that His Royal Highness the Duke of Cambridge expressed his intention of being present at the lecture this afternoon, but I received, just before the lecture began, a letter from his Aide-de-Camp, stating that he was unable to come. I am sure you will be glad to know that His Royal Highness was so kind as to have been desirous of coming if he possibly could. We have had a very interesting lecture from Major Mackinlay, and I now call upon gentlemen who have any remarks to make on the subject of the lecture to give us their opinions. The questions of artillery fire and inventions appertaining to sights are very much common property, and I have observed in my experience that a vast number of people take an interest in them; in fact, I think, the Italian saying is very applicable, "*Anch'io son pittore!*" Therefore I expect we shall have many gentlemen who will wish to make observations on the lecture.

Major ORDE BROWNE: I believe that firing has been carried on at targets representing ships in motion automatically, on Major Watkin's system, by tracing the course of the ship on a diagram, and laying on a point in the production of the line that is in advance of the ship. I was curious to know whether we could have any relative statistics as to such firing automatically and firing by judgment; also whether we could have any statistics as to the measure of accuracy that can be got with rapid machine-firing guns.

Major WATKIN: In answer to Major Orde Browne's enquiry I may state that

there have been two practical trials of the system within the last year at a towed target, both of which have been very successful. At the first practice the target was hit five times out of eleven rounds with the 10-inch R.M.L. gun, and this by what is called predicted firing. As the instrument traces the course of the vessel, it is easy to predict her position sufficiently in advance to allow ample time to the gunner to carefully lay the guns. Position-finding is being gradually applied to our forts as means are available.

Lieutenant-Colonel HUGHES, 2nd Kent Artillery Volunteers: I was desirous to mention the practice at stations where Volunteers undergo their annual practice of firing with reduced charges. My brigade practised, and we were firing at about 1,800 yards actually, but we had to use the sights for about 300 yards in excess, because we were firing with reduced charges. I should like to say I do not think that a kind of practice which is as good as if we were firing with the proper charge. It may save a little, no doubt, as far as powder is concerned, but for actual experience it is not so good. As of course we shall fire under other circumstances with proper charges, I might say, for the information of those who have an opportunity of correcting these things, that I think we ought to practise with the same ammunition we should be required to fire with if we were engaged in actual warfare, otherwise I think our experience, to a great extent, is thrown away. I have been greatly interested in the lecture, and I think I understand it, but the point with regard to firing at moving objects has always been a great difficulty. The difficulty which we have had to contend with many years ago, right up to the present, is allowing for the time of the flight of the projectile; there does not appear to me any other way now than by allowing for it by aiming in front of the object, or by putting on a sufficient quantity of deflection to cover the length of time. The tendency of a rifle-shot to go to the right is arranged for by the tangent scale inclining to the left. On the Armstrong and other rifled guns, certainly, I wanted to submit to the lecturer whether the time of flight could not be arranged for on the same system of an inclined tangent scale. Of course it would vary in reference to the speed at which the moving object was going, but still if you had a sight so arranged on the system that the speed would be twelve miles an hour it would help. It would be much better to be able to fire a gun when you were actually laying it on the object itself than laying it so much in advance of the object, and thereby perhaps lessening the accuracy of the range. I have noticed with regard to all our tangent sights on guns that they have not sufficient length of deflection-bar to allow for all these things. You get a degree, in some cases only half a degree, on the deflection bar, but if you have to allow for wind, for time of flight, the moving object, and the distance that it will get during the time of flight of the shot, you have not a sufficient number of degrees or minutes on the deflection-bar to allow for all that. The result is you have to go into guesswork, and the accuracy of the fire is very much lessened. I put these in the form of questions, because I really myself, although I have some ideas on the subject, should like those more experienced to solve that problem, which has already been alluded to, in referring to speed sights, but it has not been said which is the best plan. With regard to the Watkin's depression range-finder, I have seen it at Sheerness, and I entertain a very high opinion of it. If the inventor be present, as I am told that he is, I congratulate him indeed upon having perfected a very splendid instrument; but it requires watching, and that those who use it should know how to set it right before they start with the two cross spirit levels. Another thing is that it should be firmly set in the bed, and that the bed itself should be previously prepared, so that when you get the training on the plate, which you do get from the depression range-finder, that training may be coincident with the training required for the gun for which it is supposed to be used. At Sheerness, having given from the instrument the arc training for the gun, in order to lay it on a particular object which the glass pointed at, on going down to examine it I found that the gun had been laid three degrees differently. Somebody had gone down and told them that the red buoy was what we wanted to get, and they all laid it on the red buoy, disregarding the arc training from the Watkin's finder, and it was ultimately found that the bed on which the zero of the Watkin range-finder had been laid was at least three degrees different to

the zero of the arc training of the gun which was underneath. That should not have been. It was said that the engineers had improperly placed the stone bed on which the instrument was fixed, which shows, to my mind, that the relative accuracy of the range-finder and the gun is not often examined to see whether they really are in accord, and of course it all depends upon that. It should not only be examined when the instrument is first fixed, but also frequently afterwards, to see that it does not get out of order, or that there is not anything altered in any shape or form. I mention this specially, as the inventor of the instrument is here, because any error with regard to firing might have been laid to the fault of the instrument, when, in reality, it was the fault of the application of the instrument.

The CHAIRMAN: With reference to one remark made by Colonel Hughes I think I might give an explanation. His statement about the reduced charge would seem so extraordinary to some people that perhaps it may be worth while at once to endeavour to put it right. I would ask him whether he was made aware at the time in question that the term "reduced charge" was a new term in the nomenclature introduced; that it does not imply that the charge is not a service charge, but it simply is a new name for an old thing. Formerly we used to have two charges for the heavier armour-piercing guns, designed to penetrate armour-clad vessels. They were called the "battering charge" and the "full charge." In course of time it came to be considered as rather ridiculous that the "full charge" was not the full, that is to say that it was not the larger charge of the two: the "battering charge" was the larger. The terms were therefore altered, and they are now called "full" and "reduced," and those names are now printed upon the tangent scale. It is just possible that this being a new thing might not have been fully represented to Colonel Hughes, and he might have gone away with the impression that they were firing a charge less than the service charge, which I hardly think can have been the case.

Colonel HUGHES: It is a fact that we were firing at 1,800 yards with a 2,100 yards' sight, because the charge was less than the service charge, and it was so reduced, as I understand, to save expense.

The CHAIRMAN: I was not aware of that fact.

Colonel SCOTT, R.A.: The lecturer talked about horse and field artillery having a "fair" amount of ammunition for practice. I do not consider the amount we at present get as being quite fair, and if you will allow me I will presently tell you why. I agree that it would be very desirable to establish some method of commending such battery or batteries as achieved the best practice. In India, I understand, the result of shooting is made public each year; at home it is not, and many Majors often complain that they do not know whether they are considered to have fired well or not, or whether the Adjutants-General or other authorities were satisfied, which of course it would be very desirable that they should know. There are many reasons why the matter is much more easily done in India. First of all, the whole of the horse and field artillery are armed with the same gun, the 9-pounder; and, secondly, the batteries have all, I believe, the same quantity of ammunition each year; thirdly, the batteries are all of six guns; and, fourthly, the weather is nearly always fine. At home we have six-gun batteries and four-gun batteries. There are four different guns in use, and the batteries have different scales of ammunition, consequent on (1) whether for triennial or ordinary practice, and (2) whether possessing four or six guns. I am speaking solely, of course, of horse and field artillery; there is no doubt that batteries cannot be made to shoot without a *good* amount of ammunition, not a *fair* amount—a really *good* amount; and I think the quantity at present allotted, even for the triennial practice, can only be called *fair*. It is for a six-gun battery 510 rounds, but from that has to be deducted 60 rounds for the ten selected competitors, and six for their trial shots, or  $510 - 66 = 444$  rounds, whilst a four-gun battery in a non-triennial year has only 80 rounds altogether, or deducting the amount required for their eight competitors, viz.,  $48 + 6 = 54$ , only 26 rounds for the whole of the rest of the battery of sixty men, so that you may say that such a battery has virtually no practice at all. Before triennial practice was introduced there used to be 300 rounds annually, and there were no competitors to cause any deduction. I happened to be one of the first to go to Hay in 1876 in command of my battery B/1 R.A. The late Colonel Fox Strangways was



the Commandant. That was the first practice camp. I remember pointing out to Colonel Strangways at the time that we should lose a considerable amount of ammunition by the new triennial system. We had before 300 rounds in each of three years, that is 900 rounds; now we have 444 in the triennial year, and 54 only in each of the other two years,<sup>1</sup> being equal to 552, making the total loss in three years 348, which is a most considerable one. Colonel Strangways said to me at the time, "Let us establish the principle, and more ammunition will undoubtedly follow; if we ask for too much at first we shall get nothing. You may rely upon me to advocate more ammunition when the system has made its mark and the beneficial results have been fully appreciated." I maintain that the shooting at the close of a triennial year's practice has most materially improved, but that the interval is too long between what we may call the "service practices." Unfortunately for us all, the originator and advocate of this step in the right direction has passed away from amongst us, and therefore it is the duty of those who remain to do their utmost to obtain a sufficiency of ammunition to ensure their men being properly trained to shoot. How would a rifleman keep up his proficiency if he had only ammunition once in three years? When opportunity has offered I have advocated the issue of further supplies. A very few thousand pounds would, I fancy, be all that would be required, and if horse and field artillery are to be kept up at all, it would seem worth while to maintain them in a condition to shoot with effect when called upon, especially as now there are fewer guns. Some of the money saved by the reduction of guns might advantageously be expended in providing more ammunition for those that remain. Campaigns now-a-days are short and sweet, and there is no going into winter quarters and pulling yourself together and preparing for the next. Again, since triennial practice was introduced the period of service has been reduced from twelve to seven years, so that a gunner (unless he chances to be a competitor) has only an opportunity of firing some 21 rounds in his service. On a previous occasion I have advocated the additional supply of ammunition as follows:—For the triennial year 600 rounds, including ammunition for competition, and for the other two years 200 rounds each, making the total in three years 1,000 rounds. On thinking this over since I have, however, come to the conclusion that a biennial practice would be better, and no practice at all on the "off year," except for the recruits and competitors, who could be removed if necessary by rail to Shoeburyness or other suitable place. I should then advocate the following practice:—Ammunition: for the first, third, and fifth years 666 rounds; for the second, fourth, and sixth years, for competitors only, 66 rounds, making the total in six years 2,196 rounds. That is only an increase (over the old system of 300 rounds annually) of 396 rounds, or, to put it in another way, *the same amount as formerly* + ammunition for the ten competitors. I think the few rounds now given on "off years" are virtually useless, also that 12 case-shot are more than enough to show the men the effect; one per gun would be ample, and thus supplement a little the other ammunition. I think a recruit should have at least six rounds, the same as a competitor, to test his capabilities. I do not see how a recruit can learn to handle the two different sorts of ammunition unless he has them. It is marvellous how batteries at Hay and Okehampton improve in their shooting after a time, and the practice in driving and getting quickly into and out of action, &c., is worth anything. At first the tendency is to be slow in firing, doubtless from over-anxiety to make good practice; but as a rule the batteries that fire quickest also shoot the best. I have been five years at the Okehampton and Hay camps, and have had a good opportunity of observing this. When I speak of slow firing I refer entirely to service practice under the Commandant's own direction. Of course elementary practice is necessarily slow and deliberate. Coming to the proposal in the lecture, I am of opinion, on the whole, that as matters stand, namely, with first, triennial practice, secondly, with so many different sorts of guns in the Service, and, thirdly, with an insufficiency of ammunition, especially on off years, that it is undesirable at present to attempt to compare the shooting of the batteries, but that when these objections are overcome it would be very desirable to have two challenge cups or

<sup>1</sup> Deducting the amount required for competitors.



trophies for horse and field artillery, one for batteries armed with the 12-pr. B.L., and the other for those having the 13-pr. M.L. I take it for granted that these two guns will be some time yet in the Service; also, if it can be arranged, for the garrison artillery at home to fire a fair proportion of their ammunition from one and the same sort of gun, a similar cup or trophy should be provided for them. Of course, in each case programmes would have to be laid down by the D.A.G.R.A., as to placing and firing at certain targets, and in the case of horse and field artillery the competition might perhaps extend over two years, supposing my idea of biennial practice were introduced, or it might be awarded annually to such batteries as had practised. In the latter case no battery would have a chance of winning on two consecutive years, which would be a pity, as I think any battery winning three times in succession should retain the trophy. Batteries would have to take their chance of weather, as the time in camps is limited, and as long as it is fairly fine practice must go on; besides which, it is an advantage to fire as on service in various states of the atmosphere. There is another advantage in using a good amount of ammunition at practice, namely, to prevent any stores getting too old to be reliable, which is now often the case. I think it was last year or the year before that one battery had time-fuzes to fire, the date of manufacture ranging over as many as ten years, and it was impossible for the Officer commanding the battery to know what he was about with his fuzes, some burnt so very much longer than others. If the fuzes, owing to age, cannot be depended upon, the gunners are apt to lose all confidence in them. I think if a practice ground near Aldershot could be found, say on Chobham Ridges or Common, it would be a very great advantage, so that the Aldershot Batteries could shoot there. It is most inconvenient sending them away in the thick of the drill season, as they lose the advantage of the combined operations carried on at that time of the year, whereas if there were a range near, half of the batteries for practice could shoot in May before the big field days commenced, and the rest in August after the season is over. Land ranges in Ireland are much needed.

General SMYTH, R.A. : I have, for the most part, only concurrence to express with regard to the statements and prescriptions of the lecturer. I should, however, like the last speaker, have been glad if he had proposed additional practice for the field artillery as well as for the garrison. I well remember how our dear friend Colonel Strangways hoped that after we had made a beginning with triennial practice camps, and shown what satisfactory results they afforded, we must shortly succeed in getting annual ones. Since that time, I have been under the impression that one of the first batteries that went into our triennial practice camps was Major Borradaile's, which so shortly afterwards had the opportunity of convincing Lord Wolsley, and also the Egyptian Army, of the superiority of our current artillery practice. I always have taken that rather as a consolation for the loss of practice for two years, that we thus evidently made a really good thing of the third year. This rate of provision did very well for the Egyptian War, but of course if we come to a larger war we shall not have enough batteries prepared for it on the triennial system. With the whole of the remaining prescriptions of the lecturer I likewise concur, but I have to object most absolutely to one of his diagrams. I am sorry to see an old friend (or enemy) of mine up there on the wall, entitled "Results of Practice, under Service Conditions, and with a Position-finder" (Fig. 6). Now it is well that the point should be brought out, as so many enquiries are afield about firing on ships in motion, and especially with this beautiful instrument, the position-finder; but that diagram, I will undertake to convince anybody by a simple reference to the official record, should not be headed "results," but rather "extracts" or "selections"; inasmuch as the practice really included nearly twice the number of rounds there shown. I also object to the title for its misapplication of the term "Service conditions." In the two series thus referred to, the ranges were guessed independently by non-commissioned Officers, which is not a Service condition with heavy guns; moreover, during one of these series, the target was practically invisible most of the time, being laid over by the strength of the tide, but the guns were fired at objects mistaken for it, sometimes here and sometimes there; in the other, the view of the target was only intermittent, being constantly cut off by large masses of smoke made by blank firing from adjacent guns. I have also to remark that the red

spots are beautifully grouped there about the target; they almost look to the casual observer as if they were all hits; but there were no hits made during the whole practice; and that is what we can very rarely say of any practice, whether with the aid of the new machines or without it. Inasmuch as the talk is now of the impossibility of adequately training the men to the use of the complicated machines which heavy guns have come to be, and as here was an instrument devised which almost seemed to do away with the necessity of training the gunners, I think it well to remind you that you must not found your expectations on that diagram. Let us rather base our calculations always, if possible, on the authentic records of actual practice. I wish absolutely to absolve the lecturer from the slightest imputation of having prepared the diagram himself, but wherever I meet it—and I have seen it years ago—I know it to be fallacious.

MR. C. F. LOWE: Mr. Chairman and gentlemen, during the Crimean War Colonel Davidson, an Officer of the Indian Army, perfected a system of telescopic sights for cannon and for night firing. A series of experiments were tried at Woolwich, and a number of these telescopic sights were made and purchased by the Government, but the operations were brought to a close in consequence of the peace, and apparently matters rested *in statu quo* for many years, until the question was taken up by Major Scott. Colonel Davidson used telescopic sights on sporting rifles in India for game shooting as long ago as 1834, and this last autumn, at the age of 76, he bowled over stags on the move in Scotland with one of his favourite weapons. The principle which he introduced is applicable apparently to sporting rifles, military rifles, machine-guns, and big guns, and there is a general improvement in the standard of accuracy all round if the telescope is used. An article was published in the year 1864, which appears in the Journal of this Institution, in which a description is given of a telescopic sight as applicable to military rifles adjustable to various distances. One hundred military rifles were made by Whitworth, and fitted with telescopes of this pattern, ran the blockade and were distributed to the picked marksmen in the Confederate Army, and I have here a letter which was written in July, 1885, by a Confederate marksman who carried one of these rifles through the whole of the war, and he describes the marvellous practice that was made. I also have a letter, which recently appeared in "The Rifle," an American paper, published at Boston by a Staff Officer of the Confederate Army. He said, "I recollect that General Cleburn was greatly pleased with the work of these sharpshooters, and spoke himself of witnessing through his field-glass the unhorsing of a mounted man at 1,500 yards." Numerous instances occurred during the war of the marvellous power which telescopic sights gave to individual firing. A squad of skilled marksmen with telescopic rifles were able to silence a battery and keep it silent for a long period, and when the battery was captured it was found that no less than fifty of the gunners had been hit in the head and shoulders by their fire. So much for the question of telescopic sights as regards military rifles. I will venture to read an extract from a letter which Colonel Davidson wrote me about a year ago. "In regard to telescopes for great guns I was also early in the field. I send you an account of my invention for laying guns and mortars for night-firing by means of a telescope and the collimator, and you will see that the same telescope that is used with the collimator is available for laying guns with direct fire. I have tried it on a gun at Woolwich, and in the presence of the late Major Vandeulaur made splendid practice with it, he happening to require to fire a great many rounds to test the bushing of vents, and not wishing the shots to hit one another in the butt; a line of pegs was stuck in the butt, and we nipped them over at 300 yards with great precision." He also gives further details which I do not think I need trouble you with, and then says, "I remember when my telescope was tried at Woolwich, when the gunner was sighting with the open sight I was watching him with my telescopic one. I could see what a time he took, and how he dodged about before he was satisfied, while with the telescope it could be done in a moment and more accurately." He also told me he could lay the sights of a gun in one-third the time and ten times as accurately as a gunner could with the open sight. Another important point is that by means of the apparatus accurate firing can be carried on during the night or during the day if the smoke or fog is in the way by the use of an instrument called the collimator. The gun itself being fitted with a telescopic

sight, an auxiliary telescope is mounted in a box immediately in rear of the gun, beyond the recoil. The box is steadied by several cannon-balls, and is mounted on a pillar formed by a gabion or heap of stones, and the cross-hairs of this instrument are brought in a line with the cross-hairs of another telescope mounted on the gun, so that as long as the collimator remains in position the gun can be readjusted after every shot until the cross-hairs of the two telescopes again intersect one another, and firing can be carried on during the whole night just as accurately as during the day. I am glad to see that the gallant lecturer has also brought forward the suggestion made by poor General Gordon in his diary at Khartoum, that telescope sights are also available for use with machine-guns. I brought that forward myself about a year ago at Major Armit's lecture, and I trust we may see the use of these improved instruments in Her Majesty's Service, both for small arms, machine-guns, and great guns.

Lieutenant TUPPER, R.N. : I am afraid the Navy is in a very small minority here this afternoon. I have been waiting for some other naval Officer to get up and speak ; but apparently none are willing to do so, I have therefore to intrude with a few remarks upon this very interesting subject. First, as regards matériel, I agree with Major Mackinlay in saying that the Navy much fear high-angle fire from howitzers. Of course that fear is much increased by the accurate range-finders possessed by the forts. Without those range-finders, the firing would not be likely to do much damage, because the 75 feet beam of the largest ship is rather a small target to hit, with a high angle of descent. The idea is mentioned in the lecture of anchoring your ship, whilst attacking forts, and also of having buoys placed to steam past at fixed distances from the fort. I do not think it would be possible to carry out either of these plans of attack. With the excellent range-finders now in use, the only chance would be for a ship to be constantly on the move whilst attacking a fort, so as to puzzle the range-finder as much as it could by constantly varying the range. It must be remembered that at Alexandria there were no range-finders in the forts, and the practice from the forts was not very good. Also with regard to matériel, I am rather an enemy of the great number of fuzes we now have in the Service. In the German Navy they have but one fuze, a percussion fuze, for every description of projectile in their Service, thus doing away with complications in supply. I always have thought the percussion fuze alone is the right fuze to adopt generally. As a Gunnery Lieutenant, I always find that it is very difficult to get the men to fit their time fuzes properly ; and also in action, particularly on board ship, your range is so constantly altering, that by the time you have your shell fitted with the time fuze and rammed home you find the range has altered again, and if you have not that time fuze properly fitted there is at once a waste of ammunition ; whereas with a percussion fuze it will burst when it hits the object ; and for shrapnel shell, of course, you can burst your shell effectively by using 100 yards less range. As regards range-finding in the Navy, I do not think any instrument could be devised for accurate range-finding ; it is only by constant practice and trial shots that you can get that range. I know from constantly firing outside Plymouth Breakwater, I got pretty well accustomed to all the changes of weather, light, and that sort of thing, and I became so accustomed to the different aspects of our targets at different distances that we very often shot away the target during the day's practice. As regards range-finding by trial shots for the Naval Service, it would not be a bad plan to have some special shells fitted for, say, the 6-pounder Q.F. gun, containing a very small bursting charge, a lot of phosphide of calcium, and a very sensitive percussion fuze, so that when the shell reached the water it would burst at first graze, the phosphide of calcium would rest on the sea, and would at once ignite. We can see the smoke from our life buoys at a distance of one or two miles easily through a glass. Of course with trial shots as now carried out, you seem to forget exactly where the splash has been ; it dies away so soon, but if this phosphide of calcium were used, it would make a smoke and flame on the water for some minutes, and would thus give you some sort of idea where your trial shots had struck, and how far from the target it was. As regards sights, the 6-inch B.L. gun sight on the table is the sight originally brought out in the "Excellent," and generally called the "H" sight, it gives very good results. The fore-sight has a deflection leaf for the speed of the ship, which is a fixed quantity ; the tangent sight has a deflection leaf for the speed of the enemy,

and the deflection due to wind across range. At the same time that that sight was tried, another kind was also tried, consisting of two circles, one on the fore-sight and one on the hind-sight, the circle on the hind-sight being the smaller of the two, and of such a size that at the extent of the tubelanyard one would exactly cover the other, when the sights were aligned for the object. This sight was very good for direction, but the men who used both concluded that the "H" sight was the better of the two. Since that we have gone in for night firing with electric sights, Lieutenant Hewett, late of the "Cambridge," was one of the first to bring them out. He sent them to the Admiralty, and I believe they are now being improved on board the "Vernon." To illuminate these sights there is a local battery on the gun-carriage, and there is a little coil of P.S. wire on your tangent sight very similar to the carbon thread in the Swan lamp, and a similar coil on your fore-sight, No. 1 has a little key which he presses when he wants to illuminate his sights, and then you just have sufficient battery power to make the wires a dull red heat, so as not to make them too brilliant. Telescope sights have at present only been used in turrets and barbettes in the Service, but I hope before long to see them introduced more generally; they can be very easily fitted to all Vavasseur mountings on the same principle as the automatic turret sight. As regards training, I feel sure that all Gunnery Lieutenants want to have a great deal more gunnery training practised in our fleets. I deplore deeply the great waste of time and money that continues to go on by keeping masts and sails in ships, in which they are ABSOLUTELY USELESS. The first thing one would do, on preparing for action, is to get them out, and send them on shore or throw them overboard, and I am sure a great many Gunnery Officers would agree with me in being very glad when we do really get rid of masts and sails in those ships, in which they are absolutely useless. Of course I am not referring to ships which depend upon sail, or in which sails help their propulsion. It is not only the time occupied by sail drill, but you lose all your time when you come into port; you are always refitting useless rigging, sails, &c., at the expense of your real fighting efficiency. Your gunnery drill, which ought to be constantly carried out, is sacrificed to hauling taut ropes, unbending sails, and refitting, and the cost of maintaining these relics of the past is enormous. There is an aiming apparatus in use in the Navy which might be worth the consideration of some artillery Officers. We have them on the "Cambridge" and the "Excellent." Instead of having an aiming disc moved by hand and stopped by word of command, as shown by the lecturer, it is stopped by a rather ingenious little arrangement of electro-magnets. No. 1 has an ordinary tube lanyard and tube, and as he fires the tube with the lanyard, he completes an electric circuit, which stops a little pencil that is revolving round a white disc. The pencil is pressed against the white disc by means of an electro-magnet acting behind it, and that shows the exact spot where that pencil was on the target when No. 1 fired. The application of electricity to this aiming target is better than when the disc is moved by hand. If any Officers wish to see this aiming target, I am quite sure that the Officers on board the "Excellent" and "Cambridge" would be very pleased to show the working of it. As regards tube cannons, we use them extensively in the Navy, and with very good results. The idea of practice from forts at moving targets I think a capital one, but I certainly hope they won't try to tow a moving target with a steam launch, because I should be very sorry to be in that steam launch. If you are to have a moving target you must tow it with a long scope of rope, and at a good speed. The only thing that would be of any use in my opinion would be a powerful tug-boat, towing a large raft, and on the raft a light framework and canvas in the shape of a boat, but the use of steam launches for this purpose is I think utterly inadequate.

Major DOUGLAS JONES, R.A.: I am very glad that the lecturer referred to the very inferior gun still in the possession of our mounted branches of artillery, for I feel that it cannot be dinned too often and too loudly into the ears of those who have to vote the money that our field artillery has for many years been armed with the worst gun in Europe, and although for a long time we have had a promise of receiving the "best gun in the world," it has not yet come to pass. All I can say is, "that hope deferred maketh the heart sick." What is the present state of affairs? We have no less than four patterns of guns in our field batteries. In case of war it is frightful to contemplate the confusion that would arise in supply-

ing those four descriptions of guns with the ammunition required, besides which most of our batteries would be unable to cope upon equal terms with the batteries brought against them by the enemy. With regard to the general suggestions made by the lecturer, I will only touch upon two. I do hope that the suggestion of the Morris tubes being attached to the guns may be introduced and a good deal of practice allowed with them, in addition to the annual practice, because the present number of rounds allowed is not nearly sufficient for efficient training. I also think his idea of a challenge trophy a most excellent one, and I hope it will be carried out. We have been told it would be difficult to do so on account of the different descriptions of guns in the Service, but still I think that difficulty might be overcome by a competent Committee who could decide upon the best use that has been made of the annual practice. I would, however, suggest that there should be one trophy for the mounted branches and one for the garrison artillery. There is only one more point I desire to remark upon, and that is one on which I do not agree with the lecturer. It is with regard to the warning against any blind following of the tactical employment of field artillery by the Germans in 1870. I am an advocate for the bold handling of guns in action and in intimate co-operation with infantry. It is as much a question of taking warning how not to do it from the way in which the Russian artillery was employed in 1877, as a question of following the example set by the Germans in 1870. The Russian artillery in 1877 failed utterly, except in a very few instances, as when under the direct supervision of that bold leader of men, the late General Skobelev, when the guns did good service. After all it is the infantry on which devolves the main fighting, and I am convinced that we shall never be able to support infantry effectively in action if we rely upon the results of our practice Returns obtained at long ranges with the new modern guns. In the din of battle, with the smoke of advancing infantry, and so on, we shall be unable to support them efficiently unless some of our batteries are close at hand. In the case of an attack, for instance, the infantry first advances rapidly, then there comes hesitation and a tendency to lie down and fire. The supports and even local reserves become absorbed in the firing line which is carried forward a little farther, but comes to a halt again, and the time may come when the attack wavers between success and failure. What a grand opportunity for a mobile battery, such as a battery of horse artillery, which should be at hand to move forward on the flank of the wavering infantry and pour a withering fire into the enemy, drawing on itself the fire of the enemy, and even sacrificing itself, if needs be, in order that the infantry may live to win the day.

Major WHITE, R.A.: The lecturer suggested that a challenge trophy should be started for good gunnery. Now, as I have the honour of conducting the School of Range-finding, I should much like to see a substantial prize given annually for the best range-finding. I wish someone would put his hand in his pocket and give us a nice prize; it would be a great encouragement, and instead of wrangling about the merits of rival instruments we should get some good field range-finding under Service conditions. There is another point I must refer to, though I am rather sorry to do so, because, for once in my life, I have the misfortune to differ from my honoured friend General Smyth, who was President of the Committee on Range-finders, when I was the Secretary. He has found great fault with the diagram representing a particular practice at a trial of the Watkin position-finder, at which we were both present with the rest of the Committee.<sup>1</sup> It is all an old story now, and a great deal has been done in position-finding since then, so that the matter is not of very much consequence, but I can only say that great pains were taken at the time to ensure a conclusive experiment, and as far as possible to imitate Service conditions. The smoke that General Smyth complained of is just what you will have when a fort is engaged, and as to non-commissioned officers laying the guns, why they are the very men who do lay guns in action. There are only two subalterns in a whole garrison battery, so clearly the Officers cannot be expected to lay each gun. I believe that all the members of the Committee, which

<sup>1</sup> I was not a member of the Committee till a month later, but was deputed to act as Secretary on the occasion.

included some very able and distinguished Officers, Royal Artillery and Royal Engineer, were well satisfied as to the accurate practice that was carried out by the aid of the position-finder. It is not the position-finder we are going to have now, but the principle is much the same, and I should be sorry that it should be imagined that the authorities were introducing a new system based upon an imperfect trial. I remember, however, we made a mistake. When the practice was over and the target *hors de combat*, someone said, "Fire at a buoy for a target." There were two buoys exactly alike, and a wrong message was wired down, the result being that one operator aimed at one buoy and the other operator at another, so that there was one very bad round—that I must own—but it was an accident not likely to recur.<sup>1</sup> I should like to say something on one other subject mooted—whether field artillery should come to close quarters or not. It is a point we often discuss at Aldershot. Of course one would always like to push up close, but for guns to get very near to infantry these days of good range-takers (that, for example, Colonel Weldon has introduced) may be easier said than done. I am sure that to advance openly within effective fire of batteries possessing the Watkin range-finder would be impracticable. Give me the guns in position, and I would engage to say in an open country we should have half the enemy's horses down before they got within 2,000 yards of us. In a close country they might creep up by the roads, but, once caught sight of, it would only be necessary to bring down the leading teams, and so cause a delay which might perhaps be prolonged indefinitely.

Captain WALTER JAMES, late R.E. : You were good enough, Sir, to say that there might be other Officers in the room who take an interest in the subject of artillery. I have done so personally for some years past, and there are one or two points on which I should like to remark. First, as to the question of the gun, as shown in Table A. It always has seemed to me a most remarkable fact that although the field artilleries of Europe have for many years been re-armed with weapons which I will typify as equal to the 13-pr., we have at the present moment our artillery armed with weapons which are most distinctly inferior. It may be the fault of the British taxpayer or of somebody else, but whose ever fault it is, it is a very grave one. At the present moment the 12-pr. gun is being introduced into the Service, but I do not think there is a new type of heavy field gun settled on. The heavy field gun is represented at present by the 16-pr., which is about as comparable to the heavy field gun of France as is the old Armstrong to the 13-pr. As to there being a number of types in the Service, that is a thing we are not unused to. I remember in 1872 I was at Secunderabad. There was there a horse artillery battery, two field batteries, and a heavy battery. The horse artillery battery had 6-pr. Armstrongs. One field battery had the 9-pr. bronze gun; the other field battery had the 12-pr. Armstrong, and the heavy battery had smooth-bores. There would have been made a slight complication, as you might suppose, in serving out ammunition from the ammunition column. I may also add that the British infantry in those days had been used to the Snider, but the 76th and the 24th were armed with weapons

<sup>1</sup> I find that, speaking from memory, eight years after the time, I did not state quite precisely what actually occurred. Referring to my notes, I see that there were no bad rounds when the apparatus was used as a position-finder, that is to say, when the laying was purely mechanical. There were, however, some rounds wasted when the apparatus was tried as a range-finder, thus—

#### 4.3.79. 2nd Series. First Day.

Round 1, 500 yards, short.	{	Target had sunk out of sight, and another object was mistaken for it.	
Rounds 8 to 12 fired as one set.		{	The target having sunk, and the two operators being directed to observe a buoy described to them as the "further buoy," they directed their pointers on two different but similar buoys, causing a false intersection.
500 to 600 yards short.			

It was this mistake that led to the introduction of the single observation method now commonly adopted.



which were courteously termed Enfields, but which were really in a large number of cases mere gas pipes, because all the rifling had been really rubbed out of them by an excellent machine that the arsenal was in the habit of using for the purpose of removing rust from the barrel. There is one point about which I have a great deal of curiosity, namely, as to what are considered to be artillery ranges. If I look to the tactical authority of the British Army, Colonel Clerly's work on Minor Tactics, I find that 2,500 yards is laid down as the extreme range of field artillery. If I look to another book, which is not yet to be obtained in an English form, Prince Hohenlohe Ingelfingen's "Letters on Artillery," I find that he has very considerably enlarged views on the system of artillery ranges. I cannot help thinking that at the time the former work was written there was in existence a book by one Hoffbauer, taking us back to the battle of Gravelotte, giving the ranges used by the German artillery, which ranges were certainly in excess of what is laid down by our present tactical authority. I think therefore that a slight revision in this particular item of the authority in question might well be made, so that we should have it fairly and authoritatively laid down what artillery ranges really are under modern conditions. When I was in Zululand I had the pleasure of using the Watkin range-finder as a surveying instrument. The range-finder belonged to a battery (Lieut.-Colonel Owen's); I do not know what the pattern was, but after we had jolted up and down five or six miles of hilly country, when I came to measure the ranges, I often found that the results were not gratifying from a surveying point of view. It has always seemed to me, with the greatest respect for the Watkin, that it is not an instrument which can stand the rough handling on service. I am also informed that the range measured by the battery before going into action at Laing's Nek was considerably in excess of what it was found to be when the trial shots were made, and however good the range-finder, you are almost sure when you come to fire your trial shots to find that there is an error, and it therefore comes to this, that if your artillery is to shoot accurately, it must practise constantly. As with artillery so with infantry, it is practically impossible that they can either of them carry out what is their chief *raison d'être*, namely, to shoot well, unless they have constant practice.

Colonel RICHARDSON, R.A.: Major Mackinlay compared the shooting of the modern gun with the performance of the modern rifle, and said there was no reason that the gun should not shoot better than the rifle, or rather he implied that there were reasons why it should do so. I think there are reasons why it should not in spite of that pretty diagram; first, that the projectiles are not of the same specific gravity; secondly, that in the new gun the centering of the projectile is not satisfactory. The projectile of the rifle is soft-coated, that of the big gun is hard and imperfectly centered, and that is a good reason why the large gun should not be as perfectly accurate at its own ranges as the rifle is at its. We have already been asked "what artillery ranges are?" but, taking the range for the gun as double that of the rifle, I have given a reason why the big gun, in spite of its steady platform, deliberation of laying, and to a certain extent lack of personal error, should not shoot as well as the rifle, taking two to one as the proportion of range that the artilleryman would be shooting at. I think the feats performed at Wimbledon by riflemen will never be equalled by artillerymen with their own weapons, unless we get very much better guns. Even supposing that a perfectly accurate gun is evolved, I think it extremely unlikely that the artilleryman of that day will equal the rifleman in his performances, because it is hardly likely that an artilleryman, firing at the most two or three rounds a year, will equal a man firing probably thousands of rounds. Therefore, the Queen's prizeman of artillery will be a very poor shot compared with the Queen's prizeman at Wimbledon. Of course we know that great practice will produce beautiful shooting with big guns, but the ordinary artilleryman getting, it may be said, no practice, will always make very bad shooting, from a Service point of view. Unless the fire of artillery does become accurate from continued practice, I think the whole of the Service practice should be devoted to perfecting some system of group firing if the greatest effect from a given amount of fire is to be produced, and that probably both in field and garrison artillery. I think, under any circumstances, there is not a doubt that a good position-finder must make artillery fire far more accurate than the sight



shooting of men who practically have never laid guns at all. Mechanical laying will be the most accurate; but whether it is capable of accuracy or not it will not prove of the slightest use in war unless much studied and practised in time of peace. I am confident of that, but the artillery as a body have no practice with, or even knowledge of, any position-finder. Its use is confined to a few selected positions, it has been very seldom used, and it is a great pity that we do not know a little more about it. With regard to the expense of artillery fire, in siege practice it is certain that under nearly all circumstances, and it is probably the case in all sorts of firing, that where anything like accuracy is obtainable the most expensive ammunition to make is by far the cheapest to use. This seems a paradox, but a large shell will do more execution than four or five times the amount of smaller ammunition, costing more in the aggregate. This is certainly the case with garrison artillery, and probably would be in all branches. One plea for more ammunition for garrison gunners has been omitted, and that is the necessity for testing the mounting of the guns. I have seen guns in positions where they could not ordinarily be fired in peace time because of breaking windows, &c., and which, when they were fired, were found totally unserviceable. Guns may look very pretty and serviceable on their mountings, but there is no real test for them but actual firing. Some time ago I suggested that it might not be difficult to invent a projectile capable of raising the pressure in the gun to Service conditions and giving the proper recoil to its system, but which would nevertheless break up into harmless fragments, or be consumed in flight, at a short distance from the muzzle. I believe that an attempt is being made to supply the want, and this will enable all guns to be worked. It is improbable that sufficient ammunition will ever be granted to make any considerable number of garrison artillerymen very first class shots, and it is a question whether it would not be best to give up the attempt and devote all our energies to the development of accurate mechanical laying, which is comparatively simple with heavy guns. Whether Major Watkin's system, or any simpler one, is adopted, I question whether it would not be at once better to give up trying to make garrison artillerymen good shots. It is a very difficult thing even to make them so, and they never will be unless they get a very considerable amount of practice ammunition allowed. Major Mackinlay has told us that no very satisfactory results have been obtained by range-finders in the field, but in Afghanistan, I am told, the Weldon range-finder was used by the artillery with very good results, as regards good shooting at an enemy, in spite of rough usage and still rougher ground, by men with little training. With regard to sights, it appears to me that for years we have been spending an enormous amount of time and labour unnecessarily in teaching our gunners to lay with a sight that presents great difficulties to a great majority of eyes. A gun can no doubt be laid with considerable accuracy with our notched full sights, but to do so requires an enormous amount of practice. Many years ago, as a Brigade Instructor, a great many men passed through my hands, all of whom I tested in laying with Service sights, both at standing and moving objects. I kept a record of the results, which, as far as I recollect, showed that about 5 per cent., probably from defective eyesight, were incapable of recognizing whether a gun was well laid or not; 10 per cent. were very good from start to finish; 30 per cent. improved to good or moderate shots, and the rest were always untrustworthy. One has only to work with the instructional target to see how inaccurate is the laying with our notched sights. For the average eyesight the pinhole and cross wire is preferable where it can be used. One great difficulty in accurate firing, using the position-finder and mechanical system of laying, will be found in the variations of the wind. Fortunately, a really windy day would be worse for ships than for fort guns; but if, as Major Mackinlay indicates, the elevation, direction, and fuze ordered from the position station under Major Watkin's system is to be strictly followed, great accuracy will be impossible. With the instructional target, there is a difficulty in bringing time to bear as an element of competition. Speed depends on the proper manipulation of the triangle over which the man laying has really very little control. If he has got a good man at the triangle to help him, you will find his speed in laying improves very materially. One point omitted in the lecture is the organization of personnel as an element in accuracy, and I think that garrison

battery practice, as at present carried on, hardly represents Service practice. Owing to the very small numbers of garrison artillery, there would probably be never more than two Royal Artillery men at a gun, and a proportion of even these would be recruits or very partially trained men; therefore, for conditions at all resembling Service conditions, it is necessary to know who are to be the bulk of the workers. It seems to me that organization is an unknown quantity, which would prove a most important factor in accurate artillery fire.

Lieutenant-General Sir M. A. S. BIDDULPH, R.A., K.C.B.: In India considerable steps were taken by Colonel Adye, now General Sir John Adye, G.C.B., when the Armstrong gun first came out, to introduce competitive practice, and afterwards, under my directions as Deputy Adjutant-General, these operations were continued. I might give you an illustration of what was done during a camp of exercise under Lord Napier of Magdala. At the close of the camp we had targets placed on the River Indus, which floated down with the current, advancing at a pace of about 5 to 7 miles an hour, so that we got a very fair exhibition of an advance of troops, and batteries were brought into action at the targets at varying distances. However, this is merely to show that attention in India has been called to this subject of practice, and I know that this continues to be the case. It should be known that we have in India ranges which are not possessed here in England. Across the water in France and Germany they have very considerable ranges contiguous to their stations for field artillery practice. As far as the practice of heavy artillery is concerned it is, I think, merely a matter of money—the cost is so great of finding the ammunition. Major Mackinlay has made some observations as regards velocity. Now though it is very desirable on account of accuracy to have a high velocity in all guns intended for direct fire with field artillery, there may be a limit on account of the excessive recoil caused by extreme velocity, the recoil being very difficult to govern. The carriage of the gun has to be increased very considerably in weight, and this causes a constant drag behind the teams. There are also difficulties as regards the fuze. However, as a fact, the velocity of our guns is superior to that of other Powers, and I have drawn up a comparison of the velocities of the horse artillery guns of Great Britain, France, Germany, and Russia.

*Particulars of Horse Artillery Guns.*

	Gun.	Muzzle-velocity.	R.V. at 2,000 yards.	R.V. at 3,000 yards.
		f.s.	f.s.	f.s.
British .....	12-pr., 3-inch	1,710	993	856
French .....	12-pr., 80 mm., or 3·15-inch	1,608	920	785
German.....	12-pr., 3·09-inch	1,525	913	786
Russian.....	12·125-pr., 3·425-inch	1,350	867	751

This is calculated on the assumption that the projectiles are of the following weight: British, 12·5 lbs.; French, 12 lbs.; German, 12·19 lbs.; and Russian, 15·125 lbs. I may observe, with reference to the lecturer's desire to exchange the 9-pr. M.L. for the 12-pr. B.L., that the 12-pr. is finding its way to India, and is the armament of our field and horse batteries at home. The velocities do not differ so much at 2,000 yards, but at 3,000 yards the superiority of the English gun is very marked. This muzzle velocity of 1,710 feet is as far as we think it advisable to go at present, for at the fighting range the velocity of the English gun is superior; to

increase the velocity we should have inconveniences alluded to without much corresponding advantage. As regards the fighting range, I must say it is an exceedingly difficult thing to determine what this range is. It depends very much on circumstances of ground and of position, the temper of your troops, and the temper of the enemy, but I set it at from 1,200 to 3,000 yards. The field artillery view of the question of velocity is as I have explained. Of course for armour-piercing and long-range firing at sea, from ships on coast batteries, higher velocities are required, and these we have. Referring to the lecturer's observations on tactics, one rôle of the artillery, and perhaps its chief one, is to take up positions favourable to its action, and there engage for some time<sup>1</sup> the enemy's formations of all arms, to occupy the enemy's artillery, and thus to give the infantry and cavalry freedom to manœuvre or engage. Its duty is to assist the other arms by its fire, not by its movement, which should be restricted to the taking up of positions for some considerable length of time. The cavalry manœuvre, but the horse artillery has to take up positions to support it; the infantry also manœuvre and keep up engaging fire, but the artillery in support restricts its movement to a minimum, as when in motion it is non-effective. As regards the question of whether horse and field artillery should advance to shorter range, it must be apparent that the battery exhibits a very large target, and it must be a question for the commander of the troops, advised by the artillery commander, to decide as to how far the advance should be made. This is clear, that if at 1,200 yards a battery is doing good work, and by remaining it can still support the advance, it would lose time and effect by a forward move. It has been stated by a speaker just now that it would be completely swept off the ground if it were advancing over an open plain within effective infantry fire. It must therefore be a matter of consideration when the battery reaches a range within the effective fire of infantry whether it can best remain or advance. This question has to be decided on the spot. As to the question of instruction in range-finding, the field artillery should on all occasions of manœuvre lay the guns at some defined object and give the estimated range. I do not think in making this remark I am offering any improper criticism. I think the field artillery commanders as a rule are always doing this. I am only pointing out that this is one of the methods of instruction which exist in the hands of Officers themselves. This estimate should afterwards be proved to be correct or otherwise; and the difference, if any, be noted. Such a system does I believe obtain in all batteries, and I merely mention it as an important means of getting good shooting in warfare. I have one other remark to make, and that is this, that although it would be very unwise not to take advantage of the means afforded by range-finders of ascertaining the range, it must be recognized that these instruments are not applicable to every position, and want of time, heavy fire, and numerous causes may intervene. The method of trial shots must in such cases be resorted to, and Major Mackinlay has given some trite remarks on the subject. We all know the method of ascertaining range by observation of sound travelling at the rate of 1,125 feet per second. An interesting application of this mode is to observe the smoke of the enemy's fire, and instead of using a watch to count mentally at a rate of, say, ten counts to every 1,000 yards. This mental counting is easily acquired by having a plummet suspended to vibrate at the proper rate,<sup>2</sup> and the method tried at manœuvres has

<sup>1</sup> I think it sometimes is overlooked by commanders of the other arms that good shooting of the artillery is an operation of considerable difficulty in the field, requiring very nice appreciation of the distance and very nice adjustment of pointing and setting of fuze, also of judgment in regard to the projectile. All these matters require time and some continued staying in position. The movement from column to position may have to be rapid, but time is necessary to secure good and effective shooting. The way to shorten that time is to give a reality to field manœuvre, and always aim at defined objects, giving the estimated range and trying that range afterwards; but we want more ranges in England, and as much practice ammunition as we can get, and moving and disappearing and reappearing targets.

<sup>2</sup> The instrument used to acquire the art of counting to correct time was a little frame of wood having suspended in it a plummet, which beats at a rate representing

resulted in wonderful accuracy of estimate of the distance of the enemy. I have made these remarks very hastily, being fully occupied, and I only wish to state here publicly my very great interest in the subject of the paper which Major Mackinlay has read to us, which is one which should not be lost sight of.

#### ADJOURNED DISCUSSION.

May 2, 1887.

Major WATKIN, R.A.: Colonel Hughes in his remarks at our last meeting evidently fell into a very usual mistake in calling the depression *range-finder* which he saw at Sheerness a *position-finder*. The two instruments are, however, totally and entirely different. The depression range-finder is only intended for taking ranges pure and simple. True, it is fitted with a horizontal graduated plate, but this is only for roughly directing the gun. It is evident that even supposing the reading on the plate is made to correspond with the reading on the gun-arc when the range-finder and gun are laid on any particular object, they will not be in agreement for an object in any other direction, unless the instrument happened to be immediately over the gun. The greater the interval separating them, the greater would be the discrepancy, or parallax, as it is technically termed; and, moreover, if widely apart the ranges as well as the bearings would differ. The position-finder, however, is specially designed to not only give the range and bearing of an object from the observing station, but to automatically correct the parallax, and instantly, without any calculation, give the true range and bearing for the guns concerned. This arrangement is absolutely necessary, for in some cases the observing station is many miles away from the gun receiving the information. The position-finder is also fitted with a peculiar electrical arrangement, which at the same moment transmits the range and training to the guns. The mere act of laying the telescope effects this; so that the moment the cross wires are on the object that moment the dials at the gun mark true range and training. As far, then, as the gunners are concerned they might be enveloped in smoke, or concealed behind a hill, perfectly invisible from the enemy; or they might fire on the darkest night and yet make perfect practice. Moreover, as explained in answering Captain Orde Browne, we can now, by what is called predicted firing, make excellent practice with the rawest material. Given a very small nucleus of trained men, I will guarantee to make splendid practice at the swiftest vessel, with men who only know sufficient drill to load their guns. These are accomplished facts. Eight years ago we made the shooting shown on that diagram (Fig. 6), and within the last year other practical trials have been made at targets towed in a zig-zag course in front of the battery and, as mentioned on Friday, hitting the target five times out of eleven rounds; the others being close to it. One word only as regards General Smyth's criticism on the diagram of practice (Fig. 6), which is one I had the honour of exhibiting in this Institution at my lecture on range-finding in 1881. Time would not permit me, nor would it, I think, be advisable here to discuss those criticisms, but this much I trust I may be permitted to say, that within the last few weeks that very diagram and those very remarks were the subject of official correspondence and enquiry at the War Office. I can only say that I am perfectly satisfied with the decision arrived

for every ten beats the flight of sound over 1,000 yards of the enemy's guns or rifles. Example: The flash seen, three tens and three overs counted the enemy's position is 3,300 yards distant. The system was introduced by Brigadier-General East, commanding the Sialket Brigade in 1883-84, where I saw it practised with considerable success. It was found very applicable even to infantry fire, and Sepoys were able to acquire the art of estimation of distance by this method. There is one inconvenience, and this is, it cannot be applied till the enemy opens fire. However, this he is sure to do sooner or later.

at. But after all, as Major White remarked, this is ancient history, for the practice there depicted was made in 1879, by an instrument the original proposal for which was submitted in 1867. In these days of progress, even eight years is a long time. I certainly have not been satisfied to stand still, and I have produced, and trials have been made of, several improved instruments. The present Service position-finder is totally and entirely different from the one employed in 1879, and at least ten times as efficient. Colonel Richardson remarked that he thought weather would totally vitiate the results obtained with the position-finder. I can only say that on one of the days of trial it was quite a question whether H.M.S. "Harpy" would face the elements, and observing her through the position-finder telescope, I thanked my stars I was not a sailor. A naval Officer in his remarks deprecated the towing of targets, even with a long tow-line, as dangerous. This certainly would be the case if special precautions were not taken; but in every case that I am aware of every care has been taken, and an Officer told off to each gun, so that no accident should occur; and without a towed target I do not see how they are to have actual experiments at position-finding with moving objects. With regard to field range-finding, there has been a great deal of ancient history introduced. Captain James, for instance, referred to some of his experience in the Zulu War, which would be quite in the early infancy of the range-finder; but even then opinions differed, for Colonel Colley is reported to have very much approved of the instrument, at that very time, for surveying. Here, again, there have been many improvements, but so impressed have I been with the want of system, of proper training (or rather no training), of proper appreciation of the advantage to be obtained by the use of a range-finder, that I have purposely kept back for nearly five years a new and much more efficient range-finder until the system, now happily established, had taken effect. This new range-finder will, I think, meet most of the objections that have been urged against the present Service instrument. There is one remark of Captain James with which I utterly disagree. He says that even if we had a perfect range-finder it would be useless, owing to the variation in the strength of the powder necessitating different elevations for the same range in different climates. It is only within the last very few years that the subject has attracted particular attention, and the very great differences that arise in the velocity, due to comparatively slight variations in the hygroscopic state of the powder, appreciated; and I believe many of the adverse opinions on my range-finder are due to this very cause. But surely an Officer in command of a battery ought to know what state his ammunition is in before going into action. How easy to ascertain this by a trial shot! Suppose the range-finder to give the distance of an object as 2,000 yards, but he finds it is necessary to put the tangent scale at 2,200 yards, let him accept the facts, whether it is due to the range-finder or the ammunition, and make the necessary allowance when in action. With regard to howitzer fire, I think it was Captain James who mentioned to you the great damage that howitzer fire at long ranges would effect, and we shall not be behindhand, I hope, in utilizing this nature of fire. The accuracy with a 9-inch gun mounted as a howitzer was perfectly marvellous, and I have designed a special position-finder for working with it. With regard to telescopic sights, I do not wish to make any remarks adverse to Major Scott's system if it really does improve the shooting, but opinions are, I think, certainly divided as to the efficiency of telescopic sights, but all are agreed, I believe, as to the absolute necessity of a good telescope, unconnected with the sights. I should myself prefer a good double telescope, which can be used without any support, and which has been brought now to great perfection. The lecturer remarked on the probability of error in the Scott sight, due to the short bearing. A simple calculation will, I think, show that this source of error is by no means exaggerated. Taking the distance between the V's,  $4\frac{1}{2}$  inches, and imagine a burr, or piece of dirt, of the thickness of only  $\frac{1}{100}$ th of an inch on one of the bearings, the resulting error would be fifteen minutes of angle. In the 13-pounder M.L. gun a similar error could not be made without displacing the scale  $\frac{3}{10}$ ths of an inch, and we must also remember that a man with a good eyesight can appreciate with the naked eye an angle of one minute. I also think that a non-erecting eyepiece, as issued with the Scott's sight, is not a practical arrangement for ordinary mortals. This may not so much matter in laying at a target, but I ask anyone who

has looked at a landscape, or stack of chimneys, with a non-erecting eye-piece to say if it would be an easy matter to lay on any particular point. It is also very puzzling to lay with a reversed image. What ordinarily requires "trail right" to correct the laying really requires "trail left," and so on for the other movements. I suppose an erecting eye-piece could be issued, but it would make the instrument very much longer. Again, in the sight the angle of the elevation has to be set by means of a vernier, and I know, from long experience as a Gunnery Instructor, in the old days of the Armstrong gun, how difficult it was to teach men a vernier. I am not an advocate for telescopic sighting myself. If, however, the telescope is to be used in connection with the sight, I think that the principle I advocated some years ago, and I much regret that press of work and other untoward circumstances prevented my getting my sight ready for the trials that took place some time ago, is the right one. I have just brought it here to ventilate the subject. The principle is this, that the sight shall be used only as an adjunct, to assist the eye by magnifying the image. When looking over the sights of a gun the eye focusses first on the foresight, and then on the distant object. Why should we not have a telescope to do the same thing? My design is this. Here is an ordinary erecting telescope, fixed on the top of the ordinary tangent scale. You clamp this to the required elevation, and move the telescope until the cross wires are laid on the foresight of the gun, thereby correcting the telescope each time by the fixed gun sights. All you have now to do is to re-focus on the distant object, and lay your gun in the ordinary way, until the cross-wires are on the object. The telescope has a large object glass, and a proper directing eye-piece, so that no confusion may arise in laying. There is nothing here to get out of order, as the sight is re-set every time by the gun sights at long radius. This, I venture to think, is the true principle to work upon. A gun may often be laid on an obscure object by the aid of an opera glass, the observer going well back in line with the sights.

Major HAY, R.A.: In support of various things which were stated last time as to matériel and the armaments of our field artillery at the present moment, I wanted just to quote the numbers as they stand.<sup>1</sup> Out of 107 horse and field batteries (depôts included), there are only 20 at the present moment armed with modern accurate guns. In the First Army Corps, out of 19 batteries, there are only 11 armed with new guns, though all the 12-prs. are here; while in the Second Army Corps, of 14 batteries, only 4 are armed with 13-prs. There are 5 batteries of 13-prs. at the present moment unplaced in Army Corps which might be transferred to the First. Now to say a word about range-finding. It seems to me that a better telescope than that supplied in the Watkin range-finder is needed for the definition of the exact point of the object from both ends of the base. As there are still 15 batteries of 16-pr. guns in the Service, it would be well to draw attention to the tangent scale of this piece as perhaps one of the worst sights ever put on a rifled gun by any Government. Besides coarseness and other defects, the degrees are on the back of the scale. They are entirely hidden by the metal of the gun, and cannot be used. At the top there is the nut, which is graduated in minutes, and in using the scale the Commanding Officer of a battery has to give such a direction as this: "2,650 yards, three minutes;" and if that is not confusing to a gunner I do not know what is. I think this might be very easily changed by carrying the marking of the degree graduations slightly round the blank side of the scale. There is an unused or blank side on the 16-pr. scale, and the degrees might be carried just the least little bit round, and doing that the scale could be easily read and therefore used on the left side of the gun. I have offered to do

<sup>1</sup> There are by R.A. list of April, 1887—

71	9-pr. batteries
15	16-pr. "
14	13-pr. "
6	12-pr. "
1	7-pr. battery



it in my own battery at my own expense, but am not allowed, and I am therefore entirely unable to use my degree scale. Another difficulty caused by using a yard scale is that three distances appear to exist for every range: first, the distance given by the range-finder; secondly, the distance given by the actual use of common shell; and, thirdly, the distance required to take the shrapnel shell. That again is very confusing to the gunner, who cannot understand why there are three distances in yards for the same range. Of course if the yards disappear, and we use degrees, the confusion would cease.<sup>1</sup> Orthoptics seem to be most useful for a non-orthoptic sighted gun. There are two on the table. I get them from Steward, the optician's, in the Strand, for 3s. each, including the little case in which they are, and by offering them as prizes in each of the subdivisions for good laying, I get a number into the battery. Density of atmosphere and refraction will have to be seriously studied in order to get accurate shooting with a 12-pr. and 13-pr. These two things have not been necessary hitherto for a gunner to take into consideration with a less accurate gun. Lateral errors, owing to the particular targets which we usually fire at in the field, are generally comparatively unimportant, but errors in elevation are vital; therefore I venture to suggest that we should use continually the horizontal<sup>2</sup> line in the instructional bi-colour target. I mean turning the target so that the line shall be horizontal, and by constantly using it thus we should get a number of men in each subdivision to lay steadily, constantly, and everlastingly with a "full sight." It would be worth anything to know that certain men in every subdivision will accurately lay with a "full sight" each time you give it them to do. I would suggest the offering of prizes to encourage the laying of guns in each subdivision. I wanted to say one word about aiming tubes, viz., that the use of aiming tubes in batteries would improve the laying immensely in this way, that we should make it an afternoon pastime. In all good infantry regiments I believe there are now "shooting clubs," to which the men subscribe, buying ammunition, and using in their leisure time the ammunition for shooting. Similarly we might use some of our carbine ammunition, and we might probably buy a great quantity more. I know my own battery would be glad enough to spend a half holiday sometimes, in fact very frequently, in the use of the aiming tube. With reference to correction of fire I want to say a word or two. The lecturer did mention it; but I would press the suggestion that the zone which he described as existing between the first and second "trial shots" should be proportioned always to the range. At 1,000 yards, you would probably find 200 yards between your first and second shells sufficient; you can easily place your target between these limits; but if you go to between 3,000 and 4,000 yards' range, I think you will need a difference of 800 yards, even in some cases, or 400 yards on each side of the estimated distance. To make 600 or 800 yards between the first and second shots is not a bit too much to ensure a clear result (you may very easily have too little distance, but it is not easy to have too much). Supposing the two points of bursts to be distinctly visible under the glass to the eye of the Commanding Officer, then he will be able to place his target, remembering the effect of perspective, as was suggested by the lecturer. In reference to shrapnel fire, I am quite sure that much study and practice is needed to get a really intelligent combination of elevation and length of fuze, so as to obtain the best results. I have several times met Officers coming back from practice who have said that a gun-pit was placed in such a position that it could not be hit, and on asking what was meant, I have understood that when the time fuze was fitted, say, at 12, the shell burst 200 yards short, and that when at the next discharge it was fitted at 13, the shell burst just over the gun-pit, and therefore the gun-pit could not be hit. They forgot probably that elevation has an immense deal to do with it, as well as fuze, and that these two can be worked singly, in combination, or one against the other. I think some mechani-

<sup>1</sup> In using a yard scale one is prone to forget the accidental existence on the nut of minutes of elevation. One isn't thinking probably of minutes. This would not occur in using a degree scale.

<sup>2</sup> The clinometer (Watkin's) affords a ready and accurate means of comparing the laying of successive shots at the horizontal line.



cal arrangement is greatly needed to enable a correct estimate to be formed by a range party of the position of bursts of shrapnel; and being an Officer who has seen a great deal of range work at practice camps, I know from experience how extremely difficult it is, especially when your target is on a slope, and the gun is perhaps higher or lower than the target, to form any judgment of the exact height above plane, so as to tell the firing party the position of the burst of the shell.

Colonel STIRLING, R.A.: With reference to a remark made the other day on the subject of firing at towing targets, it may interest the meeting to know that last year and the year before we carried out the practice with a considerable number of guns in the Southern District at a towing target. The first time I saw the gun fired I must say it seemed to bear out what the naval Officer who spoke the other day said. The shot seemed to me to go uncommonly close to the vessel, and I could not understand it at the time. It was explained to me in this way afterwards, that for fear of losing one target they had taken the precaution of sending out with the steamer a second target, and that target was towed a very short distance behind the steamboat. Instead of laying the gun at the proper target, which was 400 yards away, the gun not having been properly overlooked or something of that kind, it was clear that No. 1 had laid it on the target close under the hull of the steamer. Fortunately the steamer was not hit. I think, with ordinary precautions, there is no danger whatsoever in firing at towed targets. I watched the practice most closely last year. We fired a great number of rounds from the Needles and other batteries on the west end of the Isle of Wight, but I never saw a shot go anywhere where the slightest danger would arise from it. 400 yards is an immense distance, as you will understand, when you are confined to firing at only 2,000 yards' range. It gives an enormous margin, and, I think, it is perfectly safe. Major Mackinlay very properly drew attention on this subject of accuracy of fire to the distinction between guns firing from rests and guns firing from the hand. I think he also drew a distinction between the different kinds of artillery fire—field artillery fire, coast defence artillery fire, and siege artillery fire. In all these cases we fire from a steady platform. In the case of field artillery fire there is the element of unevenness of the wheels which requires correction, but in the coast defence fire not only have we a steady platform, but we also have a level platform. The difficulty in that particular sort of fire is that we must be prepared to shoot at a moving object. In case of siege artillery practice the object is stationary. The platform is level and stationary also. Fire is deliberate, and ought to be the best of the lot. I will only say a word or two upon the second of these three, namely, coast defence practice. Of late years we have made a stride, I think in the right direction, in obtaining for field artillery a land range. We have also, I think, made a stride in the right direction in obtaining for siege artillery a special place of practice at Lydd. I think it only remains now for a suitable place to be found as a school of practice, or whatever it may be called, for coast defence artillery—a place where we may carry out experiments, year by year, with that particular sort of firing, and a place to which we may send as many of our garrison batteries as possible for carrying out their annual practice. At present I am one of those who feel that battery practice ammunition is almost wasted. I do not think it is the way to give our gunners, for coast defence practice, to bring them up to fire with what may be called obsolete guns and ammunition. The name of an Officer much interested in this subject was mentioned by the lecturer—Colonel Lyons—who unfortunately has not been able to attend here to-day; and with your permission I should like to read an extract from a letter that I hold in my hand from him upon this subject. He says: "I hope you will insist very strongly on the necessity for a school for the instruction of Officers and non-commissioned officers in coast defence practice, and for our own instruction and experiment too—as the best of us are only still groping in the dark in this most difficult and complicated subject. One thing is certain, that No. 1's must be men of some education and much intelligence, as well as simply good pointers, for we have already discovered here that an immense deal has to be left to their individual action, and that any interference with them when actually in action against a ship moving rapidly necessarily results in failure. The Officers' functions appear to be limited, once the firing has commenced, to directing at which vessel to fire, and to giving the probable speed. Such being the case you can

readily understand how complete and extensive must be the preliminary training and instruction, and how constant the practice required to form reliable No. 1's. The necessity for more ammunition you cannot too much impress upon the minds of your hearers. Nothing can be done to teach others until we know more ourselves, and that practice under Service conditions from a place like this, with every possible facility for carrying it on, alone can teach us. We have a strong tideway, a narrow channel, numerous batteries armed with a suitable gun, and, lastly, we shall soon have a position-finding system in working order. Where else can all these advantages be obtained at one place?" I agree fully with Colonel Lyons in what he has there said as to the great advantages that we may hope to gain by having such a school of gunnery for coast defence. I think it is most important that we should have such a place, and that the money that is now expended upon the annual battery practice ammunition should, if possible, be devoted to something of this kind. I would just say about coast defence practice that it seems to me to divide itself under two heads, that of drill and that of the command of work. I think under the head of drill we have that which is within the power and command of the detachment. I think there is that outside the detachment which requires to be specially attended to in coast defence work. The service of ammunition, the laying of the piece—a most important thing—all comes within the charge of the detachment; besides that there is the question of range-finding, there is the deflection-finding, and there is the communication which requires to be established for thorough efficiency between the Commanding Officer at the observing station and the gun gallery. In the gun gallery where detachments are placed in casemates we know that it is impossible for them to estimate the range or the deflection; or to judge of the results of the practice. They are absolutely helpless, I think, in regard to all these things, and they need help from outside. I have no doubt it was a knowledge of that which started Major Watkin in the labours which have resulted in what we have heard of the position- and depression-finder, and in which we wish him every success; but still we have not yet got that laid down in particular places, it is still under its trial, and I do not think we ought to be quite satisfied with giving up all our gunnery and putting it into that most beautiful machine. The stations may be cut off; we may be severed from them; and I should not like to feel stuck down in a fort with a number of men without the means of doing something. Supposing the wires were cut or the station was cut off, I should like to have some arrangements made to meet those difficulties. Where you get into a very flat country such as we have down about Spithead, the difficulty of taking ranges is very great, and none of the systems yet introduced are thoroughly successful. The Watkin depression-finder is not yet served out to these forts. They are not high enough for ordinary range-finders, and therefore we have absolutely nothing. At present we have no efficient means of obtaining the range. I think we ought not to rest there, and I do not see why we should not use what they have in ships. I do not see why we should not have in every fort a compass, not a magnetic one but a compass graduated to the north, of a certain size, with a graduated arc. I do not see why we should not be able to communicate from one fort to the other so as to give the varying position of any particular vessel, and with a chart by us why we should not be able to lay down upon that chart roughly, but fairly accurately, the position of any such vessel. Any way it is better that we should have something of that kind that is not a machine, and that would be applicable in any fort, and in those perhaps more particularly where Major Watkin's depression position-finder may never be applied. The other thing I think of importance is some means of taking the angular distance of a vessel when passing in front of the fort in some given time. That element of distance of a vessel passing in front of a fort in a given time must be taken notice of in firing at a moving target. None of the rules that have been supplied I think are applicable to it. I do not think it is possible that we should work out any of these rules for ourselves, and I do not think it is fair to expect that our men should be able to do so. We want three dials in our gallery in communication with the Commanding Officer's station above, one indicating the direction that the ship bears from the fort, another giving the range, and a third giving the deflection for a given number of seconds. I think with those things stuck up in the gallery before No. 1, it would be possible to make the detach-

ment independent, as Colonel Lyons has suggested; and No. 1 would have nothing to do but to look at the board to get the range and the necessary deflection. Given the elevation and the deflection, it will remain for them only to lay the sights on the object.

Colonel HUGHES: I wish, Sir, to explain something that I said on Friday, and, if time permits, to add to it slightly. I mentioned the other day that when the Volunteers were practising with the reduced charge, I understood the reduction was due to a desire to save expense. I have had it explained to me since that the main cause was that the guns which we were practising with were found to be unable to maintain the strain of the former charge, and that the charge has been reduced for safety. I am very glad to make any correction of any error into which I might fall, but one has always an idea, if you have no better explanation, that probably the saving of expense has been the object.

The CHAIRMAN: You quite understand it was not especially for the Volunteers.

Colonel HUGHES: I understood none but Volunteers used those guns; they are the 64-prs.

The CHAIRMAN: It was the Service cartridge. If you had to fight anybody to-morrow the same cartridges would have been used. That was the point I wanted the public to understand.

Colonel HUGHES: I am anxious that anything stated should be stated as accurately as possible, and if there are any errors into which I, as a Volunteer, may fall, you must put it down not to a want of will, but to a want of knowledge. In consequence of the higher position which the Volunteer force seems to be gradually arriving at, seeing that it is more relied upon than in the past to aid in the defence of the country, it becomes really a very anxious thing for Volunteers to see that they have the proper training and practice, and proper guns to practise with. Twenty-five years ago when I joined, we were firing with an 18-pr. with the old round shot. It used to wobble about in the gun, and would sometimes go to the right or to the left 50 or 100 yards. We practised to a very large extent with those guns, 24-prs. and 32-prs., in Plumstead Marshes, until the wreck of the Berber Railway has strewn the ground, and we did not practise last year. But with that exception we have gone down to those marshes for twenty-five years, and have fired some hundreds of rounds every year of these obsolete round shot out of these obsolete smooth-bore guns. It seems to me that training with guns of that nature will not fit our Volunteers to defend the coast, and that they will not be able to go from that practice and immediately take charge of a 10-inch gun with all its complicated machinery, which requires a great deal more training to work. It would appear to me to be about the same thing to put one of those 10-inch guns into the hands of Volunteers who have only been accustomed to fire the old obsolete 24- and 32-prs. and round shot, as if you were to put into the hands of our infantry the old Brown Bess, and then expect them when the time came to take up some weapon that they had never fired with at all, and to tell them they were now to use it for the first time, and expect that the practice that they had had with those obsolete weapons would make them perfect when they came to use modern firearms, say at Wimbledon, or in actual warfare. I feel certain that the time has come when we ought to practise with the guns we are expected to use when the emergency arises. Another point is this, namely, that Officers of Volunteers have the opportunity of going through a school of instruction which embraces a certain course at Shoeburyness. That course is no doubt short, but is still useful, but having gone through it for two months, which is the most they can go with the Government allowance, they are supposed from the Government point of view to be perfect, and always have the letters "P.S." after their names in the Army List. Now we have Officers who passed through that school ten years ago, but if they ever wanted again in the course of their lives to go through another course, they would have to do it at their own expense. I submit with great respect that the change of armament and matériel with regard to our artillery is so rapid, and the weapons are so constantly improving, that it ought not to be supposed that a Volunteer Officer who has been through that school ten years back is at the present time in the proper sense of the word a passed school Officer. He ought to be allowed, in my opinion, to go, say, every five years for a month, or if

you will every ten years for two months, and to have the Government allowance on each such occasion. It is not fair to suppose that passing an examination with a different nature of gun will cause him to be a competent Officer ten or fifteen years afterwards, when the armament is entirely altered. There is another point with regard to firing at moving objects. That is a great difficulty. Firing at a target is easy enough, but as to firing at moving objects we have not sufficient practice to begin with. I have thought for years of a plan which might help a little and be useful, but it has never been tried that I know of, and of course it is almost impossible for a private individual to try experiments of this kind. However foolish it may appear, I will be bold enough to mention it for your criticism, and for the consideration of those who are better qualified to examine into these things than I am; it is this, that at the top of a fort, say like Garrison Point Fort, or any of those forts in the Solent, a camera obscura should be erected, and on the table of that camera obscura concentric rings should be marked, so as to give every 100 or 200 yards right up to the horizontal line. Of course the lines would be so close when they got nearer to the horizon that they would be almost useless, but for a very considerable distance, 3,000 or 4,000 yards, it would be quite possible, I imagine, merely by concentric rings on the table, to show the distance which an object seen to be moving over the plain was away from that camera obscura table. A still further advantage would be derived if numbered lines were drawn outwards like the points of a compass longitudinally, to show the exact direction in which that ship was, so that it might be possible to see by looking at the table of the camera that a vessel was approaching such a number of degrees north, or whatever it was, to identify it, and so many hundred yards away from that fort. That would be constantly correcting itself by the figure of the ship being seen to be passing over the table of the camera. One objection has been urged to it; it is said it could only be used by daylight, but I am not so sure of that, because if a ship were attacking that fort the flash of the gun in the ship could be seen on the camera probably even at night, and you would put your finger at once on the place on the camera table where you had seen the reflection of the flash, and by bringing your own lamp you would be able to read the number of yards and the direction in which that ship lay. It is an idea; I do not know whether I have made myself understood; I am not aware that it is in operation; I believe it has been mentioned with regard to the laying of torpedoes, but I have not heard the idea of concentric rings or lines. I have never tried it, and it may be absurd. With regard to Major Watkin's depression range-finder, the one I was talking about was as near as possible immediately over the gun, and therefore the training shown on the plate at the foot of the instrument in that case should have been the same as the training for the gun itself below. I feel that it would be a great advantage if Volunteer Officers were allowed, and it were an understood thing that they were allowed, to obtain such books as are issued by the Artillery Institute at Woolwich. I have seen some of the books, but I believe I have had to obtain them *sub rosa*. They were certainly not available in the ordinary course at the time I studied them. Some years ago there were some very valuable papers written on the armaments of our forts at Gibraltar and other places. I had to borrow those books; I could not purchase them. I believe they were forbidden to be circulated at that time except to members of the Institute themselves. That may be a very proper regulation. You may not wish that they should get into the hands of strangers, but I think Volunteer Officers, especially those in command of artillery corps, are in such a position of trust that they should be allowed to receive, especially on payment, any of those publications in order to improve their position and efficiency. I think the time has come when the defence of the country, especially the artillery defence of the country, is put upon us as an absolute duty; we are not an auxiliary in the ordinary sense, but absolutely grafted into the ordinary defensive force, in the first line, so to speak; and it will be very important for the authorities to consider not only the question of our instruction, but also that all our detachments shall have some practice at any rate with the guns that we may have to use. Efficiency, I know, can only be obtained over a great number of years. I speak as a Volunteer Officer of twenty-five years' standing, and I must have superintended the practice of at least 7,000 rounds of gun ammunition during that time. Therefore I speak

with some amount of confidence that at the present moment, notwithstanding all that practice, our guns have been so obsolete that I fear without a great deal further training we should not be in a position to man those other and larger guns which we are supposed to be capable of doing. With regard to the sights on the 64-prs., if that gun is permanently to be fired with a reduced charge of 6 lbs., I think it is a pity that the sights are not altered.

The CHAIRMAN: I think I can tell you about that. There will be a further supply from stores for the next year, when you will get another kind of powder, R.L.G.4, with a charge of perhaps 10 lbs. or 11 lbs., and with that prospect it would be premature to alter the sights. I do not know who told you about the reduced charge, but I do not think it could have been a first-class authority. The reason of its introduction was not explained to you.

Colonel HUGHES: No. I believe it is in consequence of the weakness of the gun, but whatever powder may be introduced, if the weakness of the gun is a fact, we shall still have to use this printed table instead of the yards on the tangent scale, and the actual tangent scale used does not agree as to yards distance with this printed scale, so that one has to hold this paper in one hand and not speak about hundreds of yards at all, because that would be inaccurate, but we have to say "4 degrees 56 minutes," or whatever it may be; and I feel if the gun is going to be permanently fired with a reduced charge, the sights themselves ought to be altered accordingly, and the yards distance properly marked thereon.

Lieutenant E. T. YOUNG, R.A.: I think it has been agreed by all that the present annual practice is insufficient to meet the requirements of the present day, when accuracy of shooting, *i.e.*, hitting, is of so much importance. I have calculated very roughly that the cost of annual practice for 101 batteries of garrison artillery is 9,000*l*. This seems very little to devote to such a serious matter, *viz.*, the preparation of men to defend the country from an invader. Failing the increase of money for ammunition for more annual practice, could not some other system be introduced instead of annual practice for training our gunners? With regard to the training of field artillery, it is excellent, I think, as it stands if it were only increased and batteries had more of it; but the training of the garrison gunner is very different in all respects to that of the field gunner. The field gunner is always more or less in the open and liable to be killed, and hence all the detachments should be good shots to replace any of the No. 1's who are killed; whereas the garrison gunner should, if he is not, be entirely under cover and to a great extent safe from the fire of an enemy. Such being the case, it is not absolutely necessary in a garrison battery to have every man a shot, and yet it is absolutely necessary to have the most accurate shooting in a sea front, especially at passing ships. Ships with speeds of 17 knots passing a fort want a lot of hitting. Of course a ship would probably have obstacles to contend with and not have such a high speed. I think it is generally admitted that obstacles and guns must go together to effect a perfect defence. To get a few good shots per battery, a course of thorough training might be resorted to. If a battery sent ten or more men per annum to certain shooting depôts to go through a course of drill at laying, and then practice with firing, and then obtaining a certificate in the same way as for signalling, &c., there would be a certain number of men capable of taking charge of a heavy gun entirely, feeling a certain amount of confidence which is half the battle in himself and in his shooting. By having these stations, a system of moving targets could be carried out in perfect safety. Towing with a steam launch is not a safe method by any means, as has been stated, as, besides the danger of wrong deflection, in turning a launch, it has to pass the line of the target, and hence an accident might easily ensue. I was placed in the same position myself once out at Hong Kong. I think in the garrison artillery good shots among the non-commissioned officers and men are absolutely necessary, as the Officers of the battery would be entirely occupied in superintending the service of the guns in their charge, and they would hardly be spared to take over the duties of a No. 1 of a gun. No time in shooting can be wasted nowadays, as only a very few rounds can be got off at a passing object from one gun—three or four rounds, I think, is what we got off at Hong Kong two years ago—and to attain good results we want good shooting. For a commander of a fort to have any confidence in his position, he wants to have

trained men under him to fire the guns with perfect accuracy. I hope some change will soon be seen in the present system either in increase of ammunition for the annual practice, or a school of training formed. I should like to add that with the amount a garrison gunner has to learn in the present day, he has not much time to spare for training in laying, and I believe there is no drill so difficult and tedious. I believe the Morris tube will relieve this monotony to a great extent, and the sooner we have it throughout the Service the better.

Colonel A. MONCRIEFF, C.B. : I do not think there is any subject connected with coast artillery more important than that alluded to by Colonel Stirling, namely, the means of firing at moving, or indeed stationary objects. By means of observations made from positions outside, or away from the battery itself, which in action would frequently be smothered with its own smoke, such information can easily be conveyed to each battery. No doubt the new position-finder, where it can be used, will supply that information and the means of firing guns accurately in proportion to the length of base, or, in other words, the height of the point of observation, without the gunners themselves seeing the object aimed at; but, as was remarked, there are cases where there is no height for the new position-finder, which needs a vertical base, and in these cases it is equally necessary that batteries should be provided with external means for finding the position of ships, for indicating their movement in any direction, and for laying the guns accurately. I would suggest to our Chairman to look up the plan for doing so submitted by me to the Director of Artillery on the 31st of August, 1870, and the drawings relating thereto, which I think, if brought up to date by the use of the electrical instrument now employed, would answer that purpose perfectly well. The basis of my plan was having two external points of observation, which secured the advantage of extreme accuracy from having a long base-line, and conveying the angles simultaneously from both points at fixed short intervals of time to each battery, and afterwards suggestions for making the operation automatic. This would enable the Officer commanding each battery, or some one detailed for the purpose, not only to have the exact range of the moving vessel at each observation, but to know the direction in which it was going, and by means of a graduated racer to lay the gun accurately on the ship in advance. In the case of a moving vessel, the best result would probably be got by laying the gun in front of the vessel, and when the vessel touched the line of fire, it could be discharged either from the battery itself, or in consort with other guns from the point of observation. It would be the duty of the detachment to lay the gun with the proper allowances for error or deflection caused by wind and time of flight or otherwise. Making these allowances, plotting the telegraphed observations, &c., would be an important part of the drill required for the efficiency of each gun. The importance of being able to work guns accurately and quickly by information conveyed from without cannot be exaggerated. There are other considerations bearing on accuracy of fire which I believe were touched on at the last meeting, and which depend on the way the gun is mounted, quite independent of the gun itself, which I should have referred to, but I see opposite a gentleman who can do justice to this point. Instead, therefore, of making any further remarks myself, I would suggest that Mr. Anderson should address us upon that subject.

Major L. K. SCOTT, R.E. : I wish to say a few words about sights for ordnance. During my service I have been a Musketry Instructor for something like five years, and have gone in for the improvement of the shooting of the Army for the last fourteen years, so that, among other things, I have made a study of sighting. My idea is that no system of training, however perfect, can be of any use unless you have got good sights. By a good sight I mean (1) a sight which is theoretically sound in principle, or, in other words, which will give you a command over the axis of the gun, whether it rests on a level platform or not, without having to make and apply corrections for every change in the inclination of the sights due to a change in platform; (2) a sight which will accept your corrections in a constant manner, and which, after each recoil of the gun, will continue to give, without any alteration in elevation or deflection, corresponding constant results in the shooting. But if the sights are *not* sound in principle (such as is the case with the Service sights) you lose command over the axis of the piece as soon as the gun wheels are



not on a level platform, and the shooting must be very uncertain, although you may have had any amount of previous training in laying or in the making of calculations for correcting errors due to the inclination of the sights. With a view to remedying this defect in the service sights, I have proposed a system of sighting which will dispense with the inaccuracies of shooting due to the inclination of the wheels of field-guns. With a view to do that it is necessary to have a sight which can be placed upright whenever the wheels are inclined. We know perfectly well the first rule in musketry practice is to put the sight upright. In the case of a gun taken out on the side of a hill, the wheels are no longer level, and therefore the sight (which in the arsenal is fixed so as to be vertical in a gun with wheels on a level platform) is inclined, and the result is, of course, the shot goes to the right and low if it is inclined to the right, or to the left and low if it is inclined to the left, unless certain calculations are made to correct the error. Calculations, I believe, under fire are impossible. I think most men who have had the opportunity of seeing service will agree to this. It is for this reason that I have invented sights which dispense with the necessity of making these calculations. These sights are called revolving sights because they have a revolving movement which allows of their being placed at will into an upright position when the gun wheels do not rest on the level, just in the same manner as the rifled sights are placed vertically by turning the rifle round in the shoulder, and then you will shoot correctly. From the fact of being able to place the sight into a vertical position, a very simple mechanical system of training men in laying a gun, viz., in making corrections, has been developed. Thus, suppose from a gun sighted in this manner you fire a shot with your sight level, and you observe the point of impact of this shot when looking over the sights of a gun alongside similarly sighted and similarly adjusted and laid on the same target, and it happens to go to the right, all you have to do is to move the deflection leaf to the left till the notch of the back sight and the top of the fore sight and point of impact are in line, and by so doing you measure the amount of deflection, and if you then, with the corrected line of sight, relay, by moving the trail, the gun on the target, your next shot will go in the correct line. Of course that mechanical correction must be very much more accurate than any calculation you may make from the result of guesswork. For the Service sights, the ordinary mode of calculating the amount of deflection for an error to the right is to guess how much it has gone to the right and to reduce the amount in yards to minutes of deflection. Again, if the sight be inclined, another correction has to be made which is to multiply the difference of the level of the wheels in inches by the angle of elevation, and to divide by hundredths of the range in yards, and then to remember to give the resulting deflection to the proper side, otherwise the shooting will be worse than before. Anybody who can do these calculations under fire must indeed be an exceedingly calm man. The mechanical method of correcting errors in shooting derived from the employment of these revolving sights for guns converts the gun into a simple machine whose functions are under perfect mechanical control, and thus any man of very ordinary intelligence can with a minimum amount of training produce a maximum effect of fire. Where the country is undulating guns would generally be on a commanding position—if the shot be fired at an enemy's gun, also on a high position, and the shot go to the right and below—it is just as easy to correct the error in the elevation by the mechanical method applied vertically to the slider as it is to correct the error in direction by the mechanical method applied horizontally to the deflection leaf. There is a telescopic sight exactly on the same principle as the revolving sight, which is necessary to enable you to aim to the full range of the gun. You can of course make much more accurate observations with it than with the naked eye over the ordinary sights. Supposing you are using the telescopic sight and the shot fired has gone to the right and low, all you have to do to correct for direction is to move the horizontal pointer inside the telescope to the left, and to correct for range to depress the telescope on to the point of impact of the shot. The man who is using a telescopic sight similarly laid and adjusted on the gun alongside of you is enabled to observe exactly where it has gone, and he corrects the errors in range and direction in about five seconds. The observer gives the correction found to the No. 1 of the first gun, and relays his gun on the target. The No. 1 of the first gun does the same, and this time watches the



effect of the shot from No. 2 gun, and, if necessary, makes any needed correction, which usually is not required. All the guns of the battery are then sighted alike, and perfectly accurate shooting is the result. At Hay some two years ago there was an Officer firing with one of these telescopic sights at a field-gun in the open. I think he had to find the range. He guessed it to be about 2,300 yards. He fired a first shot with one gun, giving the proper deflection, as he thought, to the sight for wind; he observed by means of another telescopic sight on the next gun alongside the fall of the shot. He found it went somewhere to the right, too low or too high. He corrected it in the way I tell you, and in the next shot he smashed the gun up. Now a gun is a very small object at 2,300 yards—it is only 5 feet broad between the wheels—and wants a very good shot to hit it, and his doing so shows that the principle is correct. The fact of having any system of sighting which corrects mechanically all errors in shooting must be a great boon, because it enables a system of training to be developed which is easily learned by every man. Very few men can make these calculations, but if you substitute mechanical corrections for mathematical calculations of course a far greater number of men in the artillery will be able to shoot well; and as shooting is the *raison d'être* of artillery, this is a very important point. With regard to the telescopic sight, I did not come here with the intention of cracking up the advantages of my own telescopic sights, but, as Major Watkin has made some disparaging remarks regarding my telescopic sight, and had nothing to say against the one which he calls his own, I must reply.<sup>1</sup> In the first place, he referred to the distance between the V's, and said that if a burr or small grain of dirt got in between the trunnions of the sight and the V's you would get errors in shooting. I have not been working at this business for fourteen years not to know that fact. At the same time, you have your fingers, and you can give the thing a rub round, and can put your fingers through the V's and take the dust off. But even if the sight has a burr on it, it would not make any odds, because, supposing your first shot goes to the right or the left, at the very next shot you correct it; and therefore you go on shooting with your burr just as well as you did before without it. I am surprised to hear Major Watkin propounding such a weak argument against my sights. If the Service tangent sight got burred or bent you would not be able to place it into its socket, and no shooting at all would be possible. Then there is another point he also made a remark about: this sight being an inverting one—he said, what a great many people say who have never looked through a telescope sight, viz., that the inversion of the image is a trouble. I do not deny that it is a trouble, but the inconvenience vanishes by three days' use. I was requested by the French Government, some eight or nine years ago (who at first made the same objection to the inversion of the image), to supply them with an erecting image glass. I did so, and when I went to France afterwards and asked them whether they had used it, they said, "No; if a man has to learn to look through a telescope sight it is just as easy for him to learn to see a thing upside down as it is to see it erect." If you have an erecting eye-piece in the telescope it reduces the field. Of course in the field-battery telescope you must have the thing as small as possible, and when you have to make the thing small you want to eliminate everything that will make it large. With that object I keep the telescope as small as possible, and with the inverting eye-piece I get double the field which I would get with an erecting eye-piece. In the field, when you are looking through the telescope, you will understand that you ought to be able to see a good way all round the target, otherwise the finding of the object would cause delay. The erecting eye-piece reduces the field very much. When you are looking through the eye-piece, which inverts the image, you see the deflection scale exactly as you see it in your own sight. When you want to give right deflection you move the pointer along the scale to the right, and when you want to give left deflection you move it to the left. With an erecting eye-piece it is just the reverse. If then you have to teach a man to give deflection to the right, when you ought to give it to the left,

<sup>1</sup> And at the same time would remind you of the quotation—

"Hic Niger est, hunc tu Romane caveto,"

he is a rival inventor.

and *vice versa*, you would increase the complication. He said also that when you are looking through the telescope which is inverting you cannot see whether you are pointing to the top of the chimney or to the right of it. This difficulty experienced by Major Watkin is quite new to me. I was not aware that an inverting telescope possessed the property of making the head of a man change places with those of his feet. And then he referred to the movements of the trail being reversed. Supposing when you are looking through an inverting telescope you see that the pointer is to the left of the target, you do not think of the trail at all, but you see that the pointer has to be moved to the right; and so in order to get that pointer to the right you say, "Trail right." It is perfectly simple. If you see the pointer to the right of the object you want to move it to the left, and you say: "Trail left." Instead of creating a complication by having an inverting eye-piece, you really get a great advantage, and that advantage was reported upon by the French Committee who tried it in 1876. With regard to training of the batteries, it is not my business to talk on that subject; but from the point of view of an outsider who has been accustomed for many years to the training of men, I hope I am not intruding in making a few remarks. It appears to me, from having trained some 2,500 men in musketry, that the training of artillery in the use of their sights might be improved; for instance, on field days, no laying of the gun should take place without going through a rehearsal of what you would go through on actual service. The range should be found in the first place properly; the sight should be carefully laid on the object with proper elevation and deflection for wind, or anything else, and the aim should be tested by an Officer. Also, if possible, the range should be found first of all, and the sights should be adjusted under cover. For instance, supposing you are on the top of a hill, with the ground sloping to the rear, the range-takers should go out to find the range, and should come back to give it to the No. 1's who would then give the correct elevation and deflection to the sights, and then the battery should gallop up and commence firing at once. That can only be done with sights that can be put upright on the revolving principle; for, supposing that you set the Service sights (which have no revolving movement) to the correct elevation and correct deflection for wind, &c., in rear of the position, and that you galloped up to the position, the wheels would be perhaps exactly on the other tack, and the corrections you have made down below for wheels and wind would be very incorrect for the new position. The fact of being able to set a sight correctly for position is a very great advantage on the side of the gun sighted with a revolving sight. All your field-guns with revolving sights are, as it were, always upon a level platform, and there is no calculation to be made for wheels.

MR. ANDERSON, C.E.: I have considerable diffidence in speaking on the very suggestive paper we have heard, because it deals so much with the practical working of artillery. I have never laid a gun on a distant object in my life, and therefore I have very little practical knowledge of actual shooting; but I have given a good deal of attention to the theory of the discharge of artillery with reference to the construction of gun carriages, and I cannot resist the opportunity which has presented itself of asking for information respecting the effect of the steadiness of the gun carriage on the shooting. With the old short guns, firing with full charges, I suppose it is pretty well agreed that the shot had left the gun before sensible recoil of the gun and carriage had commenced, and that, therefore, any motion of the gun at an angle to the line of fire did not materially affect the accuracy of the aim. But with long guns, I think it has been proved by direct experiment, at Woolwich and elsewhere, that the shot has not actually left the muzzle when the recoil begins to take place, and it is on this point that I should like to have the opinion of the author of the paper, and of other practical gunners present, whether, under those circumstances, the motion of the gun at an angle to the line of fire, or the kick of the carriage, does not materially affect the accuracy of the aim. The transverse motion has been avoided in some gun mountings, as, for example, in a very notable manner, in the system adopted by Sir William Armstrong in mounting the heavy guns of the "Colossus" type, in which the elevation and depression is given by lowering or raising the rear ends of the slides; consequently the line of recoil is always in the line of fire, and any inaccuracy due to transverse motion is eliminated; I do not suppose that the method of mounting was adopted for the

purpose of attaining the object named, but it was a contingent advantage of it, and Mr. Nordenfelt has done the same thing in his recent mountings. He has practically done away with the trunnions of the gun, and has mounted the whole apparatus by which the recoil is controlled, so that it pivots in the vertical plane on an axis which is coincident with and at right angles to the axis of the gun, so that, in that case also, the recoil takes place in the line of fire, and it seems to me that with long guns it must be an important element in favour of accuracy. I had the privilege of seeing, last year, at St. Petersburg, the mounting for an 11-inch rifled mortar constructed by a Colonel Raskaroff, of the Russian Marine Artillery, in which he makes the mortar recoil at an angle of thirty-five degrees; that being an average inclination for high angle fire; and the accuracy which characterized the shooting of that mortar has been attributed to some extent to the steadiness of the carriage, and likewise to the fact that the gun recoiled very nearly in the line of fire. In some mountings the gun rises very quickly at the moment of recoil, and it seems to me that the consequence must be, if the shot has not left the barrel before the recoil begins, the shot must be thrown up and the muzzle of the gun must be depressed. Accordingly in such mountings we find friction gear attached to the elevating arrangements, to prevent them being broken by the tendency to rotate the guns, as this tendency must always exist if the guns do not balance at all times on their trunnions. The author has not touched upon this point, but probably he has considered it and will be able to say from his experience whether there is much importance in it. In the case of the Moncrieff mounting for larger guns, I have adopted the plan of making the base of the carriage longer than the gun itself, with a view to preventing any jump, and arranging the elevating gear so that at the longer ranges, at any rate, the gun shall recoil as nearly as possible in the line of fire. It remains yet to be seen what sort of shooting these guns will make.

MR. E. H. CARBUTT: I was glad to find that the first speaker referred to the large number of batteries which are still without the latest pattern of gun. I may say, considering that a Chancellor of the Exchequer has gone out of office on the question of War Office expenditure, it is the more necessary that those gentlemen who know our deficiencies should speak out, and let the public know that if they intend this little island of ours to be properly defended, we, who have the smallest army in the world, and have the largest possessions to defend, must be supplied with the latest and best guns that can be designed. In the House of Commons I did my best to persuade the Government to spend money upon making more guns of the latest and best type. I was much impressed a year or two ago, when going to the military sports at the Agricultural Hall, to see what we were told was the best battery in the world, to find it was supplied with an old-fashioned muzzle-loading gun. I think it was a pity when an exhibition was made of the "best battery in the world" that we should not have had a breech-loading gun to show what we were doing. I have always held the opinion that we in England do not spend enough money in experiments, and that it would be very much better if we did spend more money, for we should not then go on making guns and gun carriages which turn out not so good as they might have been if we had continued making experiments. It is also very essential that our men should be trained. We have very few men compared with foreign armies, and, therefore, it is quite right that they should be the best trained. I am sure the country would not begrudge the money. It is recommended that all these men who are to work the guns should be well educated. No doubt that would be of essential value. I think the fact of all the men in the German Army being well educated has much helped them. All the men who have to become efficient in gun practice and firing should be as highly intelligent as we can possibly make them. It is all very well to highly train the Officer, but he cannot always be with his men. Therefore it is quite right that you should endeavour to get well-trained and intelligent men. I should like to ask a few questions in reference to the diagram showing the result of firing with a 9.2 inch breech-loading gun at 1,000 yards' range. The result shows very good work; could the author state if that figure was obtained when the gun was new, or if he has any idea what number of rounds the gun fired before it made that good practice? We were told by Colonel Maitland, in a very excellent paper, at the

Civil Engineers, the other day, that in some cases the rifling is all worn away, or eroded after the gun has fired 176 charges, and I think the largest number of rounds he has got out of a gun is about 200 charges before it required relining. One would like to know at what stage this particular practice was made. May I ask the author if he has had any experience with different forms of rifling, as to the practice he can get? I have an impression that the increasing twist which we adopt is not the right system. I believe you never can get the speed forward to coincide with speed in the twist. The War Office has partly given up the increasing twist, as now you have the increasing twist only half the length of the gun, and uniform twist the other half. I do not think that would tend to accuracy of fire, because you have to alter an increasing twist to a uniform twist. Has the author had any experience on that subject, or with any other system of rifling? Perhaps he may have had some experience with the Whitworth polygonal system. My opinion is that we shall at some future time adopt a mechanically shaped shot, so that when the gun is worn or eroded you can still go on firing and have the benefit of the rifling. I also believe that in the mechanically shaped shot if any windage occurs through wear or erosion the windage will help to rotate the shot, and, therefore, will make up, to a certain extent, for the loss of rifling. I feel rather diffident in giving my opinion upon this point, because I came rather to gain information than to impart it.

Captain WALTER JAMES, late R.E.: With your permission I should like to say a few words supplementing the few remarks I made the other day. There was a point to which I meant to have alluded, and on which the lecturer has touched, namely, a matter which I may say, *en passant*, has had a good deal of attention paid to it on the Continent—the question of high-angle shrapnel fire for land service. The Prussian artillery possess a 15-centimetre short-rifled mortar, which, according to men who have had practical experience in its shooting, will render overhead cover necessary in siege batteries up to a range of 2,500 metres. I am speaking on a subject on which I have very particular information. The information in question was given me by an Officer who had charge of the siege train at Mainz: he is a personal friend of mine, and he told me that from his own experience he would say that the 15-centimetre rifled mortar would render it impossible for gunners to serve guns on any battery up to a range of 2,500 yards. I believe there is no such weapon in existence in England. It is always a little difficult of course for anybody like myself to know what is going on in England. It is always easy enough for me to find out what is going on abroad, but, as far as I am aware, judging from those excellent works, the departmental proceedings of the Director of Artillery and the Ordnance Select Committee, there is no such weapon in existence. I believe myself those weapons will have a very large influence on future warfare. I know the Germans propose to use them combined with long-range infantry fire for the reduction of small *forts d'arrêt* erected at various parts of the French frontier. If big mortars will have a great effect on the sea-going ships, so this small mortar will have a large effect on land operations. The shell it fires weighs about 80 lbs., and contains a very large number of bullets, the effect from which would be of an exceedingly murderous character. Sir Michael Biddulph gave a list of velocities of field guns the other day, and said the muzzle velocity of the Russian gun was 1,350 feet.<sup>1</sup> He was giving there the short Russian artillery gun, with which they only arm some of their horse artillery batteries. It is not quite fair to quote that as an ordinary Russian small gun, that is to say, it is not the equivalent of our new 12-pounder, and must be looked upon more as a sort of intermediate step between our 7-pounder and the 12-pounder. That Russian gun formed the armament of the Russian field batteries certainly eight years ago. The point I brought out with regard to these guns, the point which Major Hay has touched, is, that although the Germans re-armed their field batteries in 1873-74, although the French re-armed their batteries a few years afterwards, for some reason chiefly known, I believe, to the Chancellor of the Exchequer and the British tax-payer, the field artillery of England at the present moment is armed with weapons which must be looked upon

<sup>1</sup> See my article "Modern Field Artillery," in vol. xxiv of the Journal, p. 737.

as distinctly unfavourable as compared with those in use in all the great European armies. I always think on these occasions, although our audience is an excellent one, it is chiefly professional. It is hardly the army itself that wants to be educated, but it is the British Chancellor of the Exchequer, the Member of Parliament, the taxpayer that wants to be educated. If we could transfer the scene of our lectures to another sphere, I am perfectly certain the effect which they have amongst us would be supplemented by a very much greater effect exactly in the quarters in which it is wanted to take place. Major Watkin quoted Sir George Colley as an authority on range-finding. I should be the last person to detract in the least from the fame of a very excellent and gallant Officer, but I cannot help thinking that Sir George Colley's opinion on the Watkin range-finder were probably theoretical. I very much doubt whether he had had the practice with it that I have had. I very much doubt whether he was aware of the fact that occurred at the battle of Laing's Nek, and which was told me by the Officer who took the range himself. The range obtained with the Watkin was enormously out, doubtless because it was not in adjustment. This bears out what I have said, viz., that the Watkin does not stand knocking about, it gets out of gear, and then the range you get is often an absurd one. I do not decry range-finders, though I do not think the Watkin is a very good one. Major Watkin also referred to me as saying that powder and other things had to be taken into consideration. Of that I was perfectly well aware. He went on to say that supposing he got with the range-finder 2,200 yards, and found afterwards that it was only 2,000, that was of course the sort of thing that he expected would turn up. That statement contains exactly the point on which I am at issue with Major Watkin. He says the range-finder is so accurate, I say his range-finder is not always so. We must have the trial and error shot after all, and it is very little use supplementing these by an instrument which cannot be relied on always to be in adjustment.

Mr. T. NORDENFELT: As to the question of the short shot being deviated by the recoil, that is quite true as far as we have found out. We discovered that with the usual velocity in high velocity guns anything above 30 calibres began to have effect upon the firing, and therefore the recoil carriage has been made in such a manner, that when the gun recoils it lowers itself about a quarter of an inch, but is absolutely parallel to its previous position. That was the old carriage, but in the last one we made it recoils absolutely in its old line of fire. We had a very interesting result with that carriage last week at Spezia. The 6-pounder gun with 2,200 feet velocity was fired at three ranges, 1,200, 800, and 600 yards. There was no wind, the smoke hung about so that we could not see except each time we changed the aim to another target. We fired at these varying ranges, changing targets every three rounds, twenty-four shots in  $2\frac{1}{2}$  minutes, and the hits were fifty per cent., the vertical deviation being less than one metre on 6-feet targets. This shows the satisfactory construction of the carriage, as only the first shot of every three was aimed, the other two being fired without adjusting the aim. Now, allowing that we got every possible advantage in the matter of good training, sights, deviation, and all other points mentioned, I think the main point which the author has evidently taken as an axiom, is the high velocity and the proper shape of the projectile. Now, where we have to deal with shrapnel, as it is not a question of a large bursting charge, and, consequently, not a question of making the gun of a larger calibre, for the purpose only of giving more capacity to the shell, naturally you make the projectile as long as you can, and give it the highest possible velocity. For shrapnel fire this is important, but when it comes to navies or the defence of fortifications, firing at objects at sea, the question becomes still more important. Of course in fortifications for the defence of our ports, you have not the rolling platform of the ship, but you have the movement of the enemy's vessel and its speed, and for anything like such firing the very highest velocity is surely a necessity. You can always arrange recoil carriages in such a way as to take up the effect of any velocity. Just to mention one instance: in firing with 2,200 feet velocity at 2,000 yards, if we miscalculate the range of a ship 25 feet out of water, and we aim at the water line, we still hit it, miscalculating the range at 2,000 yards, 200 yards. If on the other hand I reduce my velocity to 1,900 feet, or to the ordinary velocity of the English 6-pounder, 1,856 feet, if I miscalculate the distance

of the ship at the same range by 100 yards I must miss it. For the difference between 1,900 and 2,200 you have double the chance of hitting; there is no getting over this fact. You actually double the probability or chance of hitting by increasing the velocity of the same projectile from 1,900 to 2,200 feet. Therefore I would urge, when any question of construction comes up, for positions where you cannot have time always to judge the rapidly varying distances, the exceeding importance of having the very highest velocity that can be had with safety to the gun, and which can be easily dealt with by means of the recoil carriage.

The CHAIRMAN: Before the lecturer replies, I think I may be in the unusual position of being able to give Captain James some information. How a gentleman of his known energy can say that he has greater difficulty in getting information from England than from abroad, is a thing I cannot understand. I understood him to say he was interested in the question of vertical fire from shrapnel, and thought it had not been resorted to or tried in England.

Captain JAMES: Pardon me. With the greatest deference to what you say, I did not say it had not been; I merely asked for information whether it had.

The CHAIRMAN: You were not sure whether it had or not. I have seen it tried myself, or I have seen the results of it. It was tried at the siege works at Lydd. The piece, I think, was an 8-inch howitzer, and the shrapnel was designed to throw the bullets forward as much as possible. Though the velocity was low the accuracy of the piece was very good for a high-angle fire, the burst occurred at about that position, and was such as to cause the most destructive effect upon the gun detachment round a dummy gun in a sunken emplacement against which the piece was directed. The experiment was made, and the result satisfactory.

Captain JAMES: The point I was asking was with regard to a small piece like the 15-centimetre rifled mortar.

The CHAIRMAN: The 15-centimetre is a 6-inch. You rather minimized it by describing it as a smaller piece.

Captain JAMES: It is less than a field gun.

The CHAIRMAN: It is a 6-inch rifled mortar or howitzer; this was an 8-inch.

Captain JAMES: What will the 8-inch weigh?

The CHAIRMAN: The principle is the same. The experiment was tried. I am not sure that it has not been tried also in the 6-inch.

Captain TODD, 3rd Middlesex Artillery Volunteers: I rise to back what Colonel Hughes has said about the schools. I and my two sons had two months in them, also most of my brother Officers. We represent a regiment of 960 men, all efficient. We served two months at Woolwich and Shoeburyness, going to the Guards at Wellington Barracks for six weeks. We have been told about the intelligent men that we ought to have for the artillery; well, we have them; we produce them, and we pay in money, time, and labour towards training them ourselves. The men are out of pocket also. It is not the Government that pays for the entire training, &c.; the Government Grant only covers part of the expense. It costs me at the very lowest estimate 50*l.* a year out of my own pocket for prizes and different things to assist in making my men efficient. I wish to say it is not a Treasury question; it is a question of whether the authorities will speak out unmistakably, plainly telling Members of Parliament and the general public who do not take part in the patriotic work that we are engaged in, giving them to understand that it will be a bad day for England if she depends upon two Army Corps, even though they may be of 60,000 men. Numerous brother Officers of volunteer artillery have told me that they perfectly agree in deploring the cutting down of those fine Royal Horse Artillery batteries that we have heard of to-day. It is no fault of the Royal Horse Artillery that they are armed with bad guns; whose fault is it? The fault should be found out and rectified, that Horse Artillery should be increased, only armed with better weapons, and I contend that if the authorities spoke out in a plain and honest manner to the public and to Parliament they would vote any amount required, even millions if necessary, for our defence. We had 11 millions voted once, although one million of that was lost or mislaid. To what are we relegated after all this work at the schools? We are sent to Plumstead, simply to satisfy the Government requirements that we have fired off so many rounds, and



this out of guns that are worse than useless. The whole thing is a farce. The men make a laughing stock of it. I have heard men say they could kick a football with more precision than they can send these spherical shots towards the butts. I mention this that you may know how strongly we feel upon the subject. We adopted the Morris tube the moment it came out. We gave our men an hour's practice once a week; we found the tubes and the ammunition, and the men spent an hour in what they considered recreation, although it was very hard work. We made them excellent shots, and then they went to Plumstead with their carbines.

Their practical work was certainly supplemented by theoretical work, but the practical work was much more good to them than any theory that we can give them. For 300 men in my particular division we have one 40-pr. and two 32-pr. smooth-bore worn-out obsolete guns. We simply train the recruits with the 32-prs., and then we take them on to the 40-pr., after that the greater part of our work is done with that one 40-pr., because we do not like to give the men the old weapon the 32-pr. to work on.

Lieutenant YOUNG, R.A. : I wish to answer Captain James' remarks with regard to Major Watkin's range-finders. I was at Hong Kong towing a target, and if it had not been for the possession of the Watkin depression range-finder, I feel quite certain that I should have been in great peril. The practice was really wonderful; the shooting was beautiful; the range kept varying a good deal, and yet the shots were as near the targets as they possibly could be.

Captain JAMES : I said nothing about the depression range-finder. I was referring to the field range-finder.

Lieutenant YOUNG : With regard to the field range-finder, I want to ask Captain James whether he thinks that what is more or less a very correct instrument is to be put against carrying extra rounds in the limber, for in these days, when we want to get along as quickly as possible, the less we carry the better. I have used the field range-finder; it is a very good instrument, and very accurate. I think it is simply through rough handling, that it might get out of order.

The CHAIRMAN : It is not usual for us on these occasions to ask each other questions, because you might go on to a very late hour. I have received from Colonel C. B. Brackenbury a paper which he asks me to have read, but it is against the rule to have papers read in the absence of members, I have therefore referred it to the Secretary, who will lay it before the Council. Possibly it may find its way into the Proceedings in the form of a note.<sup>1</sup> I will now ask Major Mackinlay if he has any observations to make upon the criticisms which have been offered.

Major MACKINLAY, R.A. : I will endeavour to be brief in my reply, as so many of the questions which have been raised have been replied to by other speakers; for instance, Captain Orde Browne was answered by Colonel Stirling, Major Watkin, and Mr. Nordenfelt. Colonel Scott very strongly brought out the necessity for more practice ammunition; his great experience in the command of practice camps adds weight to his words. With regard to the criticism of the diagram (Fig. 6) I can only say that I received it as a general illustration of the accuracy produced by the range- and position-finding arrangement. No doubt there is some force in the remarks of General Smyth—an Officer of great experience, and whose opinion is entitled to the highest respect—but after what Majors White and Watkin have said it seems unnecessary for me to make any further allusion to the matter. Only one naval Officer took part in the discussion, but Lieutenant Tupper gave very valuable information. I hope his proposal for a shell to leave smoke on the water to assist in range-finding by trial shots will prove a practical success. Major Douglas Jones was the first of several speakers to touch on the important question of the ranges at which horse and field artillery should engage in action; this opens out the wide subject of field artillery tactics, which I would suggest might form the subject of a future paper at this Institution. Major White's proposal that prizes should be given for range-finding seems likely to be useful, and I trust may be carried out. Colonel Richardson's words on mechanical laying are doubtless worthy of much attention; I cannot but think, however, that his remarks about the difficulty of

<sup>1</sup> The paper was considered inadmissible.—Ed.

making garrison artillerymen into good shots may lead to some misunderstanding; probably he has a high standard of excellence, and he might call a man badly trained of whom others would speak well. Only this morning I was at the Royal Military Repository, Woolwich, and there had evidence in the records on the instructional target of the accuracy of his men in laying. As the instructional target has been several times mentioned, I should like to draw attention to a small improvement which Quartermaster-Sergeant Earnshaw, R.A., Royal Military Academy, proposed some ten days ago. If the large target is held vertically the small lead triangle, on the centre of which the aim is taken, will sway about like a pendulum, and thus time is lost in adjusting it; it is therefore usual to tilt the face of the large target backwards a little; but there the triangle sticks, and only moves by jerks. The improvement suggested is the addition of two small wheels or rollers at the bottom of the triangle to enable it to move regularly. This is practically shown by the actual target before you, over which two leaden triangles are moved—one is the ordinary Service arrangement, and the other has wheels attached to it; the latter is observed to move more regularly than the others (see Plate 6). The surface of the large target should be planed smooth. If it should be found desirable that the man laying the gun should adjust the triangle himself, in order that he may not suffer from the unskilfulness of another person, I am assured by Mr. Jacob, of the firm of Messrs. Siemens Brothers, that this could readily be effected by means of an apparatus of pianoforte wire and a drum at the short distance of 100 yards, at which the instructional target is generally used. General Sir Michael Biddulph's remarks on the superiority of our new field-guns over those of other European nations are a cause of congratulation, and they furnish a strong reason for the general adoption of these pieces on a large scale, as advocated by Major Owen Hay and Mr. Carbutt. Colonel Stirling's very valuable remarks told of progress in the garrison artillery, and gave a record of what has lately been accomplished by the armament of perhaps the most important of our coast defences. I cannot say that Major Scott has convinced me that the short distance apart of the V's for his overbalance telescope sight is a matter of no practical importance; but with reference to the inverting eye-piece I should like to mention that having had no practical experience in its use as a gun-sight, a few days ago I asked Major Marshall, R.H.A., whose battery is supplied with them, if his men were puzzled by the inversion of the image in the field of view, he replied, "Not at all." He then took me to his gun park, a gun was brought out—which I laid myself by means of Scott's telescopic sight with inverting eye-piece—and one of the gunners of his battery traversed for me and appeared to understand the working of the sight, which seemed to me also easy to manipulate; an ordinary erecting eye-piece is, however, also supplied. Captain James remarked that Prince Kraft's letters on artillery have only appeared in German and in French; but I am glad to be able to say that Major Walford, R.A., has translated these valuable writings into English, and the letters have now begun to appear in the monthly issues of the Proceedings of the Royal Artillery Institution, and are attracting considerable attention. Mr. Anderson asks for information, but he himself and Mr. Nordenfelt have given us valuable facts about recoil in the line of fire which are, I think, new to most of us; though knowing for many years that the mounting has considerable influence on accuracy of fire, I only lately heard in general terms from him and from one of the Officers of the Royal Carriage Department that recoil in the line of fire is desirable with the present long guns. In reply to Mr. Carbutt, I cannot see any disadvantage in the employment of both the uniform and the increasing twist in the same gun, as one runs insensibly into the other—the uniform twist when developed on to a flat surface being a straight line which is tangential to the curve which is the development of the increasing twist; neither can I think a mechanically-fitting projectile, such as that of Whitworth or Lancaster, superior to one which is forced into grooves which are employed not only in England but also on the Continent. Windage should, I believe, be avoided to prevent the erosive action of the powder gas on the surface of the bore as much as possible. I will endeavour to find out how many rounds<sup>1</sup> the

<sup>1</sup> Major Bainbridge, R.A., has since informed me that 25 rounds had previously been fired.

9.2-inch gun had fired before the ten rounds referred to in Fig. 2. I wish in conclusion to express my thanks to many Officers of the Royal Artillery and Royal Navy and to other gentlemen who have assisted me in the preparation of this paper.

The CHAIRMAN: We certainly have had a very interesting lecture, and one which has elicited a great many observations and a great deal of discussion which I think will be of considerable interest, and I hope of practical value. Major Mackinlay felt unable to criticize Colonel Stirling's observations, but it struck me that his suggestion as to dials communicating from the Commanding Officer to the gun floor is a useful and valuable one. Of course we are all familiar with the means of communicating orders on board ship from the Commanding Officer to the engine-room, and so forth, but it has not been carried out to any great extent on land, and there is a difficulty in knowing what you have to communicate, because you cannot talk to your subordinate at length. You want to be able to give him definite orders. Of course it is easy with an engine to say, "Go ahead," "Stop," and so forth, but the idea of communicating elevations and deflections was new to me, and I think that that might be worked out. Colonel Hughes observed that he could not get the Artillery Institution Proceedings, as I understand, but I know that they go to foreign societies, therefore they are not regarded in any way as secret or confidential. I think the difficulty is more financial than anything else, and I trust if he finds a practical difficulty in obtaining them now that that may be overcome hereafter. Certainly for myself I should like to see the institutions of the Royal Artillery Regiment used to foster and encourage volunteers as much as they can in every possible way. We have had so much said as to the need of pressure being thrown upon the Administration with regard to the provision of 12-pr. field-guns, that a few words might not be out of place to describe the existing situation. I believe if at any time within the next few months an Army Corps were to leave this country it would be armed with 12-prs. entirely. I believe that if a little later next year two Army Corps were ordered abroad, they would go armed with 12-prs. entirely. That is more satisfactory than you might have imagined from the observations made in this discussion. We have certainly been a long time in getting out these 12-prs., but possibly we may have avoided some stumbling-blocks in doing so. Supposing, for instance, we had made our minds up to equip our field artillery a few years ago, we should hardly again be in a position to equip ourselves with the 12-pr. breech-loading gun that we think so highly of. In short, I think the method by which John Bull proceeds in managing his affairs shows that he is not altogether a fool. His conclusions are the outcome of a great many years' practice and experience, and I suppose he takes advantage of his insular position. It seems to me he is never in a hurry. If we had in 1873, when the Germans brought out their new field-gun, immediately rushed into the field we should have had, perhaps, after a few years the 13-pr. muzzle-loader. We should have equipped ourselves with that, and then if we had gone on a little we should have equipped ourselves with the 13-pr. breech-loader, so that we should now have been saddled with two sets of equipment, and, finally, should have wished to have equipped ourselves with a third; so that, on the whole, I think that we are not in any such a very unsatisfactory position as regards those guns. Seven batteries have already been issued. There can be no doubt that we have made a very great step in advance. Good guns I do believe do make good shooting, and I think we shall take advantage of that fact, and shall progress in accuracy also. A friend of mine, speaking to me yesterday afternoon, said: "You are going to the discussion to-morrow; is accuracy regarded as the principal thing in the artillery? I rather thought turnout and smart movement were the principal things." I must confess that in answering him I had to hedge a little. I said accuracy certainly is the principal thing, but it has not always been so regarded. I do think, however, the time may soon arrive when we shall be able to say this, that accuracy in fire is the most important accomplishment of the artillery Officer and non-commissioned officer. We have had a good description from Major Scott of his own sight, from which I think great things may be hoped. It has been a long time coming, but is now pretty well admitted into the Service, and though I have not seen shooting with it myself, I believe we shall derive great advantage from it, and also from Major Watkin's position-finder; in fact, we are at an epoch: now as to means, with the

introduction of the telescope sight and the position-finder. This is the first year in which the telescope sight, I think, will have been tried at practice camps on an extensive scale, and certainly it is the first year in which the position-finder of Major Watkin will have been used by Service batteries, not for experiment but for practice on the coast. A position-finding installation has been made at Plymouth where about half a dozen guns are in connection with the instrument, and authority has been obtained for using a certain amount of ammunition, and the Officers and non-commissioned officers will at once be thoroughly taught in the use of that instrument. I hope another year we shall be able to hear a fresh account of the result which has been so obtained. Inasmuch as Major Watkin's position-finder cannot be readily supplied all over the world wherever batteries are stationed, I think the moment has arrived when more than ever schools are necessary—that is to say, schools where men can be trained. Officers and men if they are to learn the use and practical application of the Watkin's position-finder must go to some place where it is in operation, and therefore the establishment of schools of shooting is a matter of greater importance than ever it has been before. The subject of schools has been alluded to by several gentlemen, and I am delighted to find how much it seems to be welcomed. It is the Officers and non-commissioned officers who chiefly require to be taught, and upon whom the expenditure of time and trouble in teaching them will be most repaid. When you think of the difference in cost of ammunition between supplying a whole battery of soldiers with so many rounds to fire or supplying a limited number of Officers and non-commissioned officers, I think it is clear that by the adoption of that system we shall be able to make our money go further, and the public will get a more adequate return for their money than under the old system of causing every man to fire so many rounds. No doubt the stride made recently in artillery is enormous. We have arrived not only at an epoch in means of shooting, but at a great epoch in the guns themselves. The point is how to utilize this increased power. As regards the field batteries, and the remarks made as to the individual skill of gunners in laying—though I do not quite follow Colonel Richardson—I do think there is a good deal to be said in that direction, because with the rifleman, he and his weapon are one, and he has to do almost everything—to make his own allowance for wind, and so forth, and to understand his own weapon; whereas in the case of the artillery it is different. As the Volunteers are likely to have field artillery, I should like to impress upon them that the essence of their work is to establish a thorough system of co-operation and mechanical regularity in laying so as to attain the proper direction of fire. Fire discipline for the artillery means something different from fire discipline in the infantry and other arms; it means such a mutual understanding between the Officer and those he commands, that all mistakes and misunderstandings are eliminated, that the work of laying may go on, the order once given what the elevation is to be, with most accurate mechanical regularity, round after round; that each man should understand exactly his own duty, and should do it. What they have to keep in mind is to consider the battery as a machine in the hands of the Commander, to organize direction and observation of fire, correction of sights, mechanical accuracy in laying, and the utmost regularity throughout. Hit, hit, hit, is the maxim for the artilleryman. I will conclude by expressing thanks on your behalf to Major Mackinlay for the lecture he has given us.

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Wednesday, May 4, 1887.

MAJOR-GENERAL H. C. WILKINSON, C.B., late 16th Lancers, in the  
Chair.

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STUDIES ON TRANSPORT DURING OPERATIONS IN  
SOUTH AFGHANISTAN, 1881-1882.

By Major J. D. DOUGLAS, R.A.

I THINK my appearance in this theatre to-day demands a few words of personal explanation. I wrote an unsuccessful essay for the Gold Medal competition of this year, and the referees were kind enough to infer from it that I knew something of the subject which I treated most fully, namely, transport, and desired me to read a paper on the management of transport animals in India, or some cognate subject. Reviewing my knowledge of the management of animals, I came to the conclusion that most of the handbooks for field service contain more valuable information than I can impart on the management of animals. What I hope to do then to-day is not so much to impart information as to start a discussion on certain hobbies of my own, the nature of which I hope to explain in the course of my paper. I am, unfortunately for myself, unable to give a personal narrative of any active service, but I think the period of my service from which I have drawn these "studies" is full of interest to the student of transport, however devoid it was of the stirring incidents of war. The campaigns closed by General Roberts's celebrated flying column march and the battle of Candahar, left the South Afghan Field Force with a large surplus of transport. If the transport of the comparatively small force left in the Quetta District command on the withdrawal of our troops from Candahar was not perfection itself, it was from no scarcity of Officers, trained drivers, and animals. The re-organization of the field transport was chiefly carried out by the selection of the fittest. There was no opportunity for trying experiments on such carriage as did not exist on the spot, road traction engines, elephants, horse-wagons and mule-carts, but there was practically an unlimited supply of ponies, mules, camels, and bullock hackeries. Here it may be well to remind you of what the combatant force consisted. Premising that its composition was slightly modified at different times according to political necessities, the state of affairs during the year 1881 and 1882 are fairly represented by the distribution of the troops during May, 1881. Headquarters, Quetta:



1 battalion British infantry, less 2 companies in the Pisheen, 1½ battalions native infantry, 2 squadrons native cavalry, 1 garrison battery R.A., 1 mountain battery R.A. On the lines of communication and advanced posts in Pisheen were distributed 4 battalions native infantry, 4 squadrons native cavalry, and a native mountain battery, the bulk of their strength, including the native battery and one regiment of cavalry, being on the Hurnai route. The strongest posts were Kushdilkhan and Gulistan, in the Pisheen Valley, Kuch, the head of Chuppar Rift, Hurnai, Gundkinduff, Thal Chotiali, and Sibi.

I ask you now to follow for a few minutes the movements of a small unit of the combatant force.

In February, 1881, No. 1 Bombay Mountain Battery (Native) received orders to move from Poona in relief of No. 2 Mountain Battery, which had been through the South Afghan campaigns, and was then on the move down the passes to Sibi. Our orders were to take our soldiers' families and heavy baggage to Jacobabad, where we were to await further orders as to our ultimate destination. Our route was Poona to Bombay by road, Bombay to Kurrachee by Government of India steam-ship, Kurrachee to Jacobabad by rail. For convenience of sea transport, we marched by half-batteries at an interval of about a week. I was in command of the second half-battery.

Embarking was an easy operation, the ship being in dock, and the voyage from Kurrachee to Bombay uneventful. It is worth noting, however, that the mules were placed on the main deck without bales or stalls. They were purposely packed so close that they could neither kick each other nor lie down. Some of them on disembarkation were found to be galled on the sides from rubbing against their neighbours. The galls were slight and amounted to little more than the loss of small patches of hair. The casualties were nevertheless sufficient to convince me that this system would not answer on a voyage of more than a few days' duration. Disembarking was an interesting operation. The mules were transferred to a flat-bottomed steam-barge which ran broad-side-on as close as possible to the shelving sandy shore. A gangway was run out to shore, and the mules invited to walk to land. The difficulty was that the gangway terminated in 2 or 3 feet of water, and the mules had to plunge into what to them was an unknown depth of water. I believe a mule thinks more profoundly, if less quickly, than most animals, and his opinion once formed is proverbially difficult to shake. Hearing on my way to land, from the master of the flat, of the trouble the mules of the preceding half-battery had given, I gave up the idea of forcing mine on shore against their will. I turned loose about a dozen of the mules who were nearest the gangway, sending their drivers on shore before them. Curiosity and a little judicious coaxing induced these to fill the gangway, and while those in front were hesitating what course to pursue with reference to the forbidding water and the inviting warm, dry sand beyond, their friends behind pushed them in. The flat was cleared in a few minutes, and as every mule on landing lay down and rolled as if he meant to bury himself then and there, the whole were

caught before they had thought of straying. We were entrained and arrived duly at Jacobabad. There is nothing remarkable to notice in the manner of entraining pack-mules, except that it is impracticable to keep pack-saddles on in the train. This is unimportant, except when troops of all arms are being sent on to the front by successive trains as rapidly as possible. If troop trains arrive at a terminus at intervals of about twenty minutes, it requires skill and drill to get any artillery harnessed up and clear of the station in the time, and pack animals which have to be saddled and packed with loads from their own train are apt to block a station inconveniently. We were detained waiting for orders at Jacobabad for a month, and on the night of the 18th of April, 1881, the whole battery, less, of course, families and heavy baggage, was entrained in a single train timed to reach Sibi the next morning. The next day after was spent in drawing our transport establishment, and we marched on the third day to Naree Gorge, the first post on the Hurnai route.

I found an excellent system prevailed with the Staff both at Jacobabad and Sibi. The Commanding Officer of the battery was expected to know how many railway carriages he required, how many animals he wanted for his transport, and finally how many rifles were necessary for his escort. I confess I rather shirked responsibility in answering the last question by asking in return for a general sketch of the political condition of the country. Finding on enquiry that the escort would only be required to protect my baggage column from the attacks of casual marauders, and that my own men were sufficient protection for the guns, I had little further difficulty. I trust the foregoing short account of our move by sea and land has not appeared altogether irrelevant. Our study of the transport department proper began only on arrival at Sibi.

Before leaving India I tried to get positive orders as to the amount of baggage I should be allowed. The general result was that I was told to expect carriage for service kit only, but at the same time allowed to infer that if I could transport more, I should not be committing a breach of discipline in doing so. Seeing that we expected at least two years' trans-frontier service I took, in addition to hot weather service requirements, such of the men's peace necessities as seemed indispensable for continued residence. Notably, the chief item was a *razaie*, or wadded quilt, for each man. I had no reason to regret my foresight in the end, but the extra weight entailed a certain amount of manœuvring. I found at Sibi I could get a large supply of pack transport, mules and ponies, and at first drew nearly double the number of animals I ought to have had. I moved the whole battery (three marches) to Gundkinduff, where I met headquarters and four guns of No. 2 Mountain Battery anxiously expecting relief. I discovered by the time I got to Gundkinduff that a large proportion of my transport was unsound. This was not surprising, for the transport (pack) depôt, at Sibi, was chiefly composed of animals which had been left there by General Roberts's column, on its return to India, and the best of them had already been picked for other troops moving up to Quetta. A long

rest at Sibi had apparently restored those who had arrived there lame, but they had had no hard trial of the reality of their convalescence till we worked them. At Gundkinduff my transport difficulties were over. I had orders to leave there two guns, send two to Hurnai, and two to Thul Chotiali. I gave the Thul Chotiali division a really good lot of transport animals, and marched to Hurnai with cripples lightly laden, storing my extra service regulation baggage at Gundkinduff. An arrangement with the Officer Commanding No. 2 Mountain Battery that he should send back for my battery the best of his transport animals from Sibi relieved me of all further trouble. When I had weeded out and returned my unfits, I had on charge as battery transport about 80 ponies and 60 mules, with three camels and 20 doolie bearers for sick carriage.

The battery remained at its three stations till the autumn of 1881, when it was ordered to concentrate at Hurnai and march to Quetta. Previous to the battery's march I got our extra baggage all stored at Sharigh, conveying it there with the battery transport, and we marched in service order. At Hurnai we found the 24th Bombay Native Infantry under orders to move to Kuch, and we proceeded under their escort. They were less fortunate than we in the way of transport and the bulk of their baggage was carried in bullock carts. I do not think these carts accomplished much more than one mile an hour, there being an ascent of about a thousand feet a day for the first two days, while all the marches were more or less against the collar, or rather yoke. Besides the bullocks in carts the regiment had a number of pack-bullocks. These animals were amusing to watch, but a source of great grief to the regiment. Bucking off their packs or getting suddenly footsore were among the least of their peccadilloes. Those whose entire interest in life was not crushed out of them by their loads would on every possible opportunity rush off from the track into the jungle and generally get rid of their burdens before they could be caught and brought back. From Kuch to Quetta we had as escort a squadron of Scinde Horse, and could thus march our best. With an easy fall of a thousand feet in 15 miles, we found our transport column did 3 miles an hour including stoppages. At Quetta my 120 ponies and mules were exchanged at the transport depot for 100 good sound level mules, greatly to the advantage of the battery. We had four or five expeditions from Quetta during the succeeding year, and in all, my transport worked well. I need go no further in my personal narrative, but trust you will take it for granted that I had ample opportunities of studying mule-pack transport brought as near perfection as it has ever been in our Service. I have said nothing about the camel. I could say a good deal against him, but scarcely a word in his praise as a regimental transport animal in a hilly country. I hope to introduce him again to your notice when speaking of transport of lines of communication.

I now propose to sketch shortly the organization of the Transport Department as I knew it. One of the chief causes for its success was that it was a separate department completely severed from the

Commissariat Department with which in India, as in England, transport is associated. I may be wrong, but it seems to me that it is difficult for one single department to work both supply and transport in war-time. In peace it is no doubt both economical and convenient that the small transport cadres kept up should be entirely at the service of the Commissariat. But in war-time the Transport Department becomes itself one of supply, and has to organize, drill, and provide carriage for corps and regiments, for the ordnance and commissariat, and for ambulance services. The successful Transport Officer is likely to spend more time in the saddle, or in his cattle lines, than at his office desk. These at all events would appear to have been the views of the Government of India in organizing the Transport Corps I am trying to describe. Regiments and batteries drew their transport establishments complete. The Commissariat Department drew its Station and field column carriage in the same way, but requisitioned convoy carriage as required from the main depôt at the base, at first Sibi, and later on, Rindli. Once drawn, regimental and field column carriage passed entirely under the control of the regiment or department, the men and animals being paid, rationed, and foraged regimentally. Sick carriage was drawn and kept up regimentally. Neither the Ordnance Department nor the Medical Staff had, as far as I know, any separate field carriage during the period under review, but the principle of each corps and department having its field carriage under its own control was fully recognized. Two large depôts were retained in transport departmental charge, that at the railway terminus containing chiefly bullock carts intended for convoy service, and that at Quetta a reserve of mules to be drawn on as required for Staff and other purposes supplemental to regimental transport. Doolie bearers, who form part of all Indian sick carriage, remained in Commissariat charge, a fixed establishment being attached to and paid by regiments and batteries, while the reserve remained as it does in India directly under the orders of Executive Commissariat Officers.

There were then two main divisions of transport, namely, regimental and other field column carriage, and secondly that of the service of the lines of communication, which for simplicity's sake we may call convoy carriage. After the departure of camels, pack bullocks, and ponies to India or elsewhere, the field carriage consisted almost entirely of pack mules, convoy carriage of bullock carts. Pack mules were allowed one driver to three mules, and were tied heels to head in strings of three by the attachment of each of the two rear mules of a section of three to the saddle of the one in front of him. I think ordinary baggage mules should be trained to travel in droves without leading. Civilian mule drivers in most mule countries use them in this way, and there seems no reasonable objection to the adoption of the plan. Ammunition mules should of course be led, and led singly, as they may be required to keep up over rough ground under fire with infantry moving at the double. Mules are generally considered very surefooted animals, but broken knees are not uncommon

among them. The explanation of this apparent anomaly is that a mule allowed to pick his own way seldom falls except from sheer want of strength, but a mule ridden at speed or dragged by the head against his better judgment over rough ground, and so prevented from placing his feet where he likes, is sure to fall sooner or later. I may remark that among battery mules, which are generally led, and worked with a view to their carrying their loads over the worst conceivable ground, I have never seen a mule lose his footing going down hill. Accidents when they occur are almost invariably due to the mule being exhausted during a steep climb upwards. He flounders or trips upwards from want of strength, and then if there is a precipice right or left of him he in struggling up loses his balance and starts for a roll to the bottom. Even at this dangerous game mules are seldom as much damaged as their loads are.

There are three different methods of leading either mules or horses.

First. Place yourself on the near side in line with the fore feet, hold the reins short with the right hand close behind his jaw, and keep the end of the reins in the left hand. If necessary you may touch the animal behind the girth, or threaten him with a whip or the end of the reins held in the left hand. Your right hand will generally be solely employed in checking and guiding him. Second. If you want to lead a horse or mule over a jump or along a narrow path, give him as much rein as possible; move in front without looking back or tugging on his mouth, and he will generally follow so fast that your only difficulty will be to keep clear of his jump or scramble. Third method, of which I only advise trial to convince you of its probable failure. Look the horse full in the face and step backwards yourself in front of him. The reason for looking him in the face is that you will thereby induce him to stand still until you get what I wish you to have, a good firm pull on the reins. As you put your weight into the struggle the horse will throw his head up so as to transfer the pull of the reins from his mouth to his poll. If he is blessed with a patient quiet temper he will stand still; if not, he may rear up and strike at you with his fore feet. In any case the chances are against your getting him to move in the direction of the pull. But this system of leading, which we may fairly characterize as utterly vicious, is the one actually pursued with Nos. 2 and 3 of a section of three tied together croup to nose in the usual manner pursued by the Indian Transport driver. Pack mules strung together in threes if fairly well laden do over fair ground from  $2\frac{1}{2}$  to 3 miles an hour. This is good going as compared with that of camels or bullock carts, but it is considerably under the natural pace of a single laden mule. We find in a mountain battery that the pace is regulated by the marching powers of the men. If every man in a battery can do his 4 miles within the hour the mules keep up without a sign of distress. In a transport column, on the contrary, the slowest, worst laden mule sets the pace. I do not think myself we should consider the pace of a transport column thoroughly satisfactory unless it can be regulated by that of good infantry, and if transport can be devised which will keep up at a walk or very slow trot with cavalry and artil-

lery, so much the better. As regards infantry transport, I believe the desired result can be attained in the following manner:—Divide regimental baggage into three sections. The first should comprise only such absolute necessities as reserve ammunition, pioneer and entrenching tools, water in very hot weather, or blankets in very cold weather. The second section would include tents, cooking utensils, and such stores as may generally be left without very great inconvenience two or three hours behind. The third section would consist of service luxuries, such as Officers' mess, baths, filters, and two-thirds of the Officers' tents, changes of clothing for all ranks, Quartermaster's stores, office books, files of correspondence, &c. The first line of regimental transport would then carry the stores necessary for a battle and bivouac, the second the additional ones required to convert the bivouac into a camp without any superfluity of comfort, the third the necessities for keeping the field in health and fair comfort for some months. I do not know if I am justified in mentioning luxuries as among the articles to be carried by the third line. I have heard it whispered that members of the Staff in some of our campaigns have been known to drink champagne, enjoy a bath, and sleep on mattresses and stretchers instead of wrapping themselves only in their cloaks with their saddles for pillows. I am on safer ground when I mention changes of under and outer clothing and boots as among the articles which must be carried somewhere by Officers and men on a campaign, and which yet can well be spared if necessary for a week at a time. Section No. 1 should in my opinion be carried by first-class mules led by native drivers and by privates of the regiment, one man to each mule, Section 2 by mules driven without leading, Section 3 by light mule carts.

I once marched about 150 miles in rear of a field oven, carried on a mule, one of a section of three, and again on another march behind another section of three mules carrying the reserve ammunition of a squadron of Scinde Horse. In each case my guns were greatly delayed, and we had frequently in our own interest to help both the oven in the one march and the ammunition in the other. Why the oven should have formed part of the fighting column, or why the cavalry ammunition should not have been placed in the troopers' wallets, I have been unable to ascertain; but both incidents combined to convince me that improvements might be effected in the distribution of baggage.

Leaving the Sections 1 and 2 for the present, I proceed to describe the description of cart I propose for the transport of Section 3 of regimental baggage, and to discuss the general question as to whether any carts may be fairly expected to keep up with infantry on the march. The cart to which Captain Heyland, of the Bombay Cavalry, gave his name, was successfully tried during the Afghan campaign. It travelled well over all the military roads used by our troops. It broke down only when overloaded or when it was tried over ground utterly impracticable for wheeled traffic. Used for its legitimate purpose of carrying loads of 500 lbs. over even very rough military roads, it attained distinct and signal success. To carry out the principles I advocate for



regimental transport, the total number of mules would be reduced by at least one-third, and of the remainder one-third would be put into draught. Take for illustration a supposititious transport unit of 120 mules and forty drivers. As pack mules they would carry, allowing one-sixth for weakly and spare mules,  $100 \times 200$  lbs. = 20,000 lbs.; 80 mules under my proposed system would carry 21,500 lbs. as follows:— 25 carts  $\times$  500 lbs. = 12,500 lbs., one spare cart *nil*, 45 pack mules  $\times$  200 lbs. = 9,000 lbs., 9 spare mules *nil*. We should retain the original 40 drivers, 26 with carts and 14 with 54 mules. Of the 48 laden pack mules probably 12 would carry ammunition and be led by privates, 2 first line necessities, and this would leave 12 drivers to 34 laden mules, which they would conduct in a drove. I think this system would ensure the pack transport keeping well up in the required position with reference to the infantry column. Whether the carts would be able to keep their stations is a matter of experience. From Sibi to Quetta, both *viâ* the Bolan and *viâ* Hurnai, the road was constantly traversed by bullock carts. The route from Chuppar Rift to Quetta *viâ* Kuch was made practicable for carts before the summer of 1882. From Quetta to Candahar, if the proverbial coach and four could not be driven owing to bad crossings of watercourses, certainly a field gun can, and an American stage coach would make nothing of the difficulties of the road after those of the Far West. A similar remark would apply to the Quetta-Khelat road. I think it can be proved that the use of light mule carts is, if desirable, practicable wherever a British Army is likely to march from India, operating from a base along lines of communication. Leaving India for a moment, it is probable that they would be out of place in countries such as parts of North Africa, where deep loose sand renders nugatory the mechanical advantage of wheels, or where, as in Ashanti, traffic is carried through forests by narrow single file paths. They would also be useless for the small flying columns sent against refractory Hill Tribes on our Indian frontier, where the ability to move irrespective of beaten paths is a *sine quâ non*. I have mentioned the Heyland cart as a model. This cart has long shafts of hollow bamboo or of iron gas piping, a light axle, and low wheels. I forget the diameter of the wheels, but if I am not right at putting it at 40 inches, that height would do very well. The shafts form two of the sides of the platform of the cart, and the shafts, and consequently the platform, are nearly horizontal. There being no springs, the platform has two struts to connect it with the axle on each side. For those who have seen neither the Heyland cart nor an Ekkha, I may state that a costermonger's donkey barrow is as near a representative of the cart as I can think of. In the original Heyland cart, as in the Ekkha of Northern India, the platform is flat. It should I think be made of loose strong tarred cord network, sinking in the middle, as the lower the load the more stable will be the equilibrium of the cart. It is well to have no special harness for these carts, but to attach the shafts by short chains like those on an English farm cart, to the ordinary service pack saddle. The breast piece and breeching of the saddle would take the

draught of the cart. The use of the pack saddle not only simplifies equipment, but if a short piece of impracticable road is encountered, the mules can carry the loads over the obstacle in two or three trips. The carts themselves must take to pieces and be put together again without the aid of skilled labour. For instance, I have stated that the Hurnai route at the time I knew it (now it carries a railway) was practicable for bullock carts. It was so generally, but riding once from Hurnai to Gundkinduff I found that about 200 yards of the road lay under 10 feet or so of water. This was at Spin Tungi, or the White Pass, so called from the marble walls which enclose the defile. The river had come down in flood, and hollowed out a deep clear pool to where the road had been. I found a large convoy of bullock carts waiting for the repair of the road, but turned the obstacle easily with my own baggage on mules by a mountain path.

I have not yet fully stated the considerations which lead me to believe that the pack carriage of regiments should be reduced to a minimum. Some of the pleasantest years of my life have been spent in mountain artillery, and I am the last to decry the judicious use of pack mule carriage. At the same time the disadvantages of pack as opposed to wheeled carriage have been the more prominently brought to my notice from having studied both descriptions of transport. To take the obvious disadvantages first. A pack mule carries 200 lbs., but on a decent road he can drag three times as much. In a word, pack carriage is more expensive than draught carriage, and a column of pack animals is much longer than one composed of carts. The less obvious but equally forcible objections to pack mule transport will be understood from the following extract from the diary of a mule, whom I have credited with the ability to write and converse with his comrades. If I cannot vouch for the document being genuine, I can for the incidents being not only possible, but probable:—

*"Monday.*—Force ordered to march at 5 A.M., very cold night, below freezing point, day hot. I am the gun mule of No. 1 Subdivision, No. 20 Mountain Battery. At 3.30 reveillé sounds. I am roused by my nosebag and feed being put on. At 4 I am saddled up and fall in my place. My load is not very comfortable, but in the middle of the march it is shifted on to my relief mule, and I come in fresh and well.

*"Tuesday.*—The march is a repetition of the day before, except that I have been shifted to the ammunition column, and I have to carry my load the whole way. Still during two short halts, when the cavalry of the force dismount and infantry pile arms, my load is removed, and I rest with other animals and the men. In the afternoon I break away from my picket lines and wander into the camp of an infantry regiment, where I am secured and tied up among the transport mules. I gather from my new comrades that in this regiment mules are expected to be saddled ready to carry their loads half an hour before reveillé, but beyond seeing that they are fed, neither Officers nor men take much trouble about them.

*"Wednesday.*—March as before ordered for 5 A.M. At 2 my clothing

is removed and carefully rolled up before me, after which I am saddled, and my driver sits down near me to smoke and await orders. At 3 I am led out, thoroughly chilled and hungry, to stand near the tent I am to carry. At 3.45 the tents go down by word of command in beautiful order, and by 4 o'clock I am being walked round in a ring carrying my load. I am the last of a string of three, and I understand the other two would lie down if not walked round. I am glad to begin the march at 5. Half way I hear the halt sounded far ahead of me, and pull up as I am accustomed to do at the sound. Alas! it is not meant for the straggling baggage column, which has to close up and recover its lost ground. For another ten minutes we move on, and we halt in our places just as the head of the column falls in to move on again. Before the next halt I have been moved to the head of the baggage column, and so do halt, but to my surprise, although my load is examined and adjusted, it is not removed, and standing under it rests me but little. As I afterwards saw, if it had been removed repacking it would have been a comparatively lengthy operation. I was unfeignedly glad to find myself recognized, and led back to my own honourable post in the battery the same evening."

My friend the mule you see did not complain of absolute ill-treatment. Lest you should think he was biased against the infantry by the fact that he belonged to another corps, I may explain that he would have fared little better if he had been among the baggage mules of his own battery. In fact in infantry regiments, if Officers and men will assist in the saddling as well as in the packing of their mules, the waiting about before fall in sounds is shorter than it is for the baggage animals of a mountain battery. But at the best, the packing daily of loads which if carts were used would be left on them all night, and the fact that baggage mules once laden must stand under their loads when the men are resting, entail a lot of fatigue on soldiers and animals which is unknown when cart transport is available.

So far I have spoken only of infantry regimental transport. Mountain artillery transport should be organized on the same lines. Like the infantry, gunners and drivers can well afford to leave their spare suits of clothing behind them on a pinch, and it is unnecessary to carry half-wroughts for repairs and other Quartermaster's stores close up with a battery.

It is specially desirable to limit the number of pack transport mules with a mountain battery, because there are comparatively few men available to pack baggage in addition to guns and ammunition. For field batteries and horse artillery I would have no pack transport at all. The best carts for them would be after the model of Maltese carts, but constructed for double draught. I should prefer pole currie with long reins to shafts and a riding driver. The reason I have for selecting this pattern is that a two-horse cart with a track nearly the same as that of the guns would not be too cumbersome to follow wherever the guns could go, while on many country tracks in India formed by bullock carts a two-horse cart travels comfortably in the broad deep ruts, and it is almost impossible to drive a single-horse vehicle

owing to the uneven state of the untrodden middle of the track. Probably South African roads are similar. For cavalry I would have what I have called Sections 2 and 3 of infantry baggage carried in the same way as for infantry. Section 1 should, I think, not exist among cavalry requirements, but if it is considered necessary to keep some baggage animals close to cavalry, as was the case when, as I have mentioned before, the head of my battery was led day after day by a string of these mules carrying cavalry ammunition, I am of opinion that the pack mules should be led by mounted troopers. I have not tried the plan on parade, but on shooting and fishing expeditions on the Hurnai route I proved over and over again that my tent and personal baggage could get along well at 6 miles an hour, the pack animals being led by mounted armed drivers, who thus formed my escort. If not necessary for cavalry, trotting pack baggage animals might with great advantage be used by Staff and other Officers, whose duties compel them to make very long forced marches unaccompanied by troops over difficult country.

I purpose concluding the field transport portion of my paper with a few remarks on two questions which require very careful consideration from all employers of pack transport, being details connected with the two great desiderata, sound backs and sound feet.

Our Indian service pack-saddle is very satisfactory, but it, like all pack-saddles, is very heavy as compared with riding saddlery. A 3-lb. saddle is not very comfortable to man or horse, but a 10-lb. saddle will carry most moderately built men. Of course military saddlery is a good deal heavier again, but its weight is nothing compared with that of a pack-saddle. A mountain battery ammunition mule carries between saddlery and line gear about 90 lbs. before he is laden up. A transport mule has a rather lighter cradle or tree, and is seldom indulged with such heavy blankets, so his accoutrements weigh less, but I believe I am safe in putting them near 70 lbs. In the riding world you may have noticed there are two distinct schools of saddlery, agreeing in theory but differing in practice. The military saddler (using the term saddler in its best sense, and so including General Sir Frederick Fitzwygram's Committee) fits his tree to the horse's back, and regards his panels only as a lining to the tree. The average saddler of the shops selects his tree with reference to the general style of seat of his customers, and to the average girth of the class of horse, cob or pony, likely to carry it. But beyond this, all final adjustment of the saddle to the horse is made by the arrangement of the panel stuffing. Although the military saddle is heavy to start with, and necessarily so, it seldom gains more than a few ounces in fitting. I speak especially of the latest pattern cavalry saddle. The possessors of hunting saddles are not so fortunate. Without pronouncing between the two schools, I may state that military and all other pack-saddles follow the civilian saddler's principle, a cradle or tree made to suit the load on its upper surface, and curved to follow only the general shape of the mule's back and ribs. The panels are to all appearance of extravagant dimensions, but all

experience has been to show that unless they are made and, by constant repicking and stuffing, kept, to the dimensions of two huge pillows, a sore back is only a question of time. Now every transport mule carries a thick blanket, and in anything like a severe climate, two. These are a dead useless weight in the day time, and they ought to take the place of a portion of the panel stuffing. Blankets placed between the mules' backs and the saddles have been tried with partial success, but the difficulty of getting them evenly folded in the dark, and of inspecting them before the load has been put on, has caused the plan to be looked on with disfavour. Whatever may be said, and there is a good deal, in favour of its adoption by cavalry, I think there is no doubt that the folded blanket numnah for pack transport is out of the question, or only to be looked on as a makeshift, to be applied to individual mules when a threatened sore back may be saved by an altered distribution of pressure. Unfortunately the idea I am about to propound occurred to me only after it was out of my power to test its practical working. If it has been tried by others, I should like to know the result. I would suggest that panels made, as now, of leather next to the saddle tree, and serge next to mule, be used, but should have on their upper surface large leather pockets, in which blankets folded in four should be placed. I can myself see the defects of the plan, but I do not think them insuperable.

The second point I wish to touch on is the necessity for shoeing transport mules, and as my opinions are opposed to the practice of our Indian Mule Corps, whether artillery or transport, I purpose going more fully into the subject than I should if I had only to tell you what is generally thought in India, namely, that mules do not require shoeing. Mules are bred in India in sufficient numbers to keep up mountain batteries, and the peace establishment of transport. I may be wrong, but I do not think they would be bred at all if Government did not buy them. That is, they form no important portion of the ordinary carriage of the country, although no doubt, if the Indian Government perseveres in its present wise course of encouraging mule breeding, they may. When during the Afghan War there was an extra demand for mules, purchases were made in Cyprus and Persia. I had an opportunity of inspecting a sufficiently large number of these animals to satisfy myself that in these two countries mules are usually, if not invariably, shod. I believe in Spain mules are not only shod in civil use, but the mountain battery mules are shod. What the practice is in South America I do not know. I should like to learn, and further to know, if mules are not shod there, what sort of work they are called on to perform. In India our mountain batteries have found that they can work without shoes. Following their experience, the Transport Department discarded shoes, in opposition to the practice of Cypriotes and Persians, and, I think, of most mule masters. Were they right or wrong? Of course if an animal can do his work without shoes, he is much better without them; whereas on our macadamised roads shoes are necessary, they are a necessary evil. Further, a mountain battery mule is expected to climb like a goat, and if shoes are necessary for him they should

be made of something more like horn than slippery smooth iron. The shrunken almost rudimentary frogs induced in too many of our English horses by the use of shoes not only indicate the approach of something very near unsoundness, but they are the cause of many more falls than is generally known.

A mountain battery mule works, as all troop animals should, well within himself. His strength is husbanded for the supreme effort he may be called on to make at any moment. If I may borrow a phrase from the practical mechanic, our horses and battery mules are not under ordinary circumstances worked within one half of their breaking strain. Our transport animals are worked near it, and it would be false economy to husband their strength, as we properly do that of the combatant portion (men and animals) of an army. So a civilian mule owner carrying a heavy load day by day finds the extra expenditure entailed by shoeing money well spent. He would scarcely shoe if he did not find it pay.

My experience of marching exactly tallies with a statement I heard made by an experienced battery Officer, namely, that mules worked continuously over hard ground require shoeing, while mules worked two or three times a week, or even for two or three weeks together, with intervals of rest, do not. I found that on the march many footsore animals could be made to work sound by shoeing. Whether transport mules start at first with or without shoes, I am certain that each section should carry a supply of shoes, especially of fore-shoes, and at the first symptom of their hoofs being too much worn down, the shoes should be put on.

I shall not detain you long over the subject of road as distinct from field transport. The Government carriage employed for the general transport of stores and provisions during the time I am considering was mainly composed of bullock carts. A proportion of Government stores and nearly all bazaar supplies were carried on the contract system, by camels. The contract was for the safe delivery of goods consigned. That these camels should work well, while those owned by Government did not, may seem to reflect on our Officers' management, but it rather proves that Indian camel carriage is unsuited to the Afghan hills. The camels employed by the caravans were either Bactrian or a cross between hill and plain camels.

If Government had owned the same breed of animals, equally good work might have been done by them. The Pathan caravans were very unevenly laden, some camels carrying double the ordinary load, and some little, or even nothing. They were grazed every day when not actually marching, and in hot weather marched at night. Grazing seems to be essential to the health of the camel, although probably the owners of these animals looked more to the economy of the plan than to anything else.

The bullock carts used were worked right along the line by the same bullocks, failing of course sickness or lameness. That is, they marched by stages. It appears to me the relay system, by which the carts could have travelled, if necessary, day and night, would have been much better on the Bolan route. Of course the return journeys



of the bullocks would have been generally wasted, but the aggregate waste of power would not have been greater than that of the return of the whole convoy. The large depôts at Sibi and Rindli would have given place to small depôts at each of the posts. The labour of supervision for Transport Officers would have been greater, but the nature of the work not distasteful to the majority of them. A model for the relay system existed in the Government bullock trains, worked in various parts of India, notably between Lahore and Peshawur, before the opening of the Northern State Railway. As the system was well known, probably there were some good reasons against its adoption with which I am unacquainted. I think that on this line, before the railway was opened, and indeed on many other roads which have been, or may be, lines of communications, use should have been made of light horse or mule tramways. On the Indian frontier no mean seems to be recognized between a railway and the roughest of military roads, between the steam engine and the old world bullock cart. If bullock carts had been worked by relays, it would surely have been possible to run laden carts over part of the route by placing properly constructed trollies under their axles, leaving them to be passed over steep gradients or other obstacles in the old way. For instance, from Sibi to Rindli, and from Durwaza to Quetta, are sections of road whereon a light horse-tram might have been laid out without any engineering difficulties, almost without skilled labour.

I have touched on many subjects in the course of my paper, so many that I have treated few of them at full length, and the conclusion of my lecture will be of a still more cursory nature. India is a happy field for the Transport Officer; England, I fear, almost a hopeless one. To work out a proper transport scheme for England would be as hard as getting the nation to consent to the enforcement of the constitutional law of compulsory military service, as it exists. If—how tempting and yet how hopeless is the word—the country would admit and put in practice the principle that every citizen must, if fit to bear arms, voluntarily enter the Army as a regular, as a Volunteer, or as a non-combatant, or elect to stand the ballot for the Militia, how easy it would be to make reforms. The bulk of the non-combatants to which I refer would be the drivers of the tradesmen's and farmers' carts, who now escape the carriage tax, and the carts and wagons, if fitness for military service were made a condition of their exemption from taxation, would help us much towards a cheap and expansive transport system. The recent reduction in the strength of the Royal Artillery is still a matter which has not ceased to exercise the minds of military men. The part of the scheme which has excited the least remark in Parliament up to this time is that which refers to the employment of reserve field batteries as ammunition columns. The "Standard," I think, was the first newspaper to point out that this means that in the event of two army corps being sent abroad for service, the garrison army of the country, regulars, Militia, and Volunteers, will be left as destitute of artillery as they now are of transport. The idea of employing artillery on transport

duties is neither novel nor altogether distasteful to us artillerymen. We have a natural prejudice in favour of our arm, but still, if it is a question of remaining behind as gunners, or of going on service as a transport train, we should individually be glad to go in the latter service. They manage things better abroad, and we ourselves manage, as I hope I have shown, better in India. If my sketch of Indian transport helps anyone to work out a scheme of transport for the Home Army, I shall not have spoken in vain.

In conclusion, apart from the division of baggage I advocate, I should strongly recommend, as the first principle of field transport, that regimental and departmental field carriage should be formed complete at the base; or, in the case of an expedition by sea, at the port of embarkation, that of lines of communication in the theatre of war. For instance, a force intended for service in Asia Minor might conveniently equip and drill its regimental transport units in Cyprus; one for European service, in England; or one for service in the Far East, in India, the Dominion of Canada, or Australia. Money spent in landing complete transport with regiments in a theatre of war is well expended, even if, as regards the amount of carriage in the country, it might appear like carrying coals to Newcastle. Whatever carriage the country we are operating in affords us, it should in the first instance be considered as only available for lines of communication, and not be in any sense relied on for field column transport.

The CHAIRMAN: There are some points in this paper upon which I wish to say a few words. The first thing that strikes anyone who has been much connected with transport duties abroad is the unquestionable advantage of having mules as baggage animals; they are so far better than any other sort of animal; their skins are much tougher than either ponies' or bullocks', and they will stand rough treatment and bad food very much better than either those or donkeys. They have another very great advantage, which is that if they are ill-treated or neglected they will make themselves heard. No Officer in charge of mules can possibly have his mules neglected without being aware of it, because they make such a noise when short of water or food that you cannot hear yourself speak in the camp. This may appear but a slight advantage, but it really is a very great one. With regard to the three methods of leading or driving mules, I had an opportunity the other day, on the return of Sir West Ridgeway from Afghanistan, of meeting him as he came out of the Khyber Pass, and I was much struck with the admirable manner in which his baggage was conveyed on the Persian system. It was entirely carried by very fine mules, and they were driven in gangs. It appears that mules will go in gangs as docilely and in as compact a formation as a pack of hounds if each gang is given a leader, and, strange to say, that leader must be a pony. Those ponies are highly prized in Persia and command high prices. I know that owners have refused as much as 500 or 600 rupees for a very moderate pony, just because he was a good gang leader. The mules will follow them anywhere. It was part of the amusement of the camp to turn one of these leaders loose and hunt him round the camp. His gang of 15 or 20 mules would follow him wherever he went, under tent ropes, round tents and back again; nothing would persuade a single mule to forsake his leader. This system appears to be an admirable one for reducing the number of the drivers. These, as you so justly remark, are a very great drawback to any system of "single-animal" transport. It may be interesting to the meeting to know that in India measures are now being taken, most carefully, to reduce in every way possible the baggage of an army, and probably before long in that country an entirely new scheme will be devised by which a great many of the so-called luxuries will be cut out of the baggage of armies when taking the

field. I regret that in most mountain mule batteries in India the mules are not interchangeable, as they must have been in the battery of the mule whose diary has just been read. In fact there are three classes acknowledged, and three prices paid—the ordnance mule, which carries the gun; the ammunition mule, which carries the ammunition; and the baggage mule, which carries the baggage of the battery. It is unquestionably desirable that these should all be of the same class, so that they can be changed. If a mule is weak or in any way slightly injured, it might be put to lighter work, and a fresh mule brought up from the ammunition column or baggage column. I am glad to say from my own knowledge that the use of mules is increasing in India. It is becoming quite fashionable amongst the natives generally to use them, therefore the demand is increasing, and consequently the supply, so that I trust that whoever lives to see the next three or four years will find that in India we shall have a grand supply of mules, produced in the Punjab, and there are none finer in the world. I have lately had the pleasure of seeing a lot of young mules, purchased by an artillery Officer in the Punjab, than which I have never seen finer. They were only three-year-olds, which is too young for any animal to begin work, but they were far finer than any mules I have seen either brought from Italy or Spain. The price paid was very reasonable, certainly under 350 rupees each. When two years have passed over their heads they will be as grand a lot of mules as anyone can wish to have for ordnance purposes. With regard to the use of carts as transport, I suppose that there can be no two opinions that light carts are the perfection of transport if you have the roads, but unfortunately in many of our wars besides those named by the lecturer (for instance in Burma and in Afghanistan), wherever you leave the main roads you frequently come to insurmountable obstacles which completely stop your carts; they are therefore always looked upon with disfavour by those who have to lead small forces into an unknown country. Besides the many obvious advantages of a cart, there is this one, that it forms a very convenient and grateful shelter for the drivers in hot or wet weather. The tarpaulin or any part of the covering of the baggage (most carts would carry a tarpaulin) forms an extemporary tent which is an extremely useful and valuable protection. But there is that one great drawback, that a cart can never go off a road of some sort, whereas a mule can go anywhere. It is perfectly astonishing the places over which mules will go with their guns and with heavy baggage, so that they are of all transport far and away the best the soldier can use. With regard to the question of the employment of blankets as a pad to protect the mule's back, this is undoubtedly very good in theory, but imagine this system in use in a bivouac on a wet night. You have to depend entirely upon your blanket for protecting your mules' backs, either by the pocket system, or in the ordinary way, which was in use in the cavalry when I first joined the Service, and was also employed in the German Army eight or ten years ago (it may not be now); well, we will suppose that it is a wet night, most of the mules are lying down, and some have been rolling, just imagine the state of your blanket in the morning! it is pitch dark, you have to get ready so as to move off at daylight. You find your blanket clotted and simply imbedded with mud. You can hardly lift it, it is so heavy. What are you to do with it? this blanket has to be folded and placed under your horse's saddle. Of course the thing is out of the question; you would probably have to leave it on the ground; there is no doubt that that is the case in many campaigns in wet countries. Another thing is the great difficulty of folding it properly in the dark even when your blanket is dry and fairly clean. Again, on a windy night, it is extremely difficult to fold it nicely and keep it on the horse's or mule's back. Before you can put your saddle on the wind blows the blanket off, so that it takes two men to do the thing. It may be interesting to know that as far as shoeing goes in India, the rule now is that no horses, mules, or other animals are shod unless they are found to require it; with transport animals it may be difficult to adopt this system, because they are not so closely supervised, but I think we may depend upon it that in the future it will be the standing order that the moment animals require shoeing they shall be shod, and when they do not require them the shoes will be taken off, and Nature allowed to keep the hoof in its proper healthy state. I have one more remark to make about the admirable manner in which the Pathans and Beloochis

manage to convey our baggage for us on camels. The real secret of the matter was touched on by the lecturer, but he did not fully explain it. The fact is that they know the capabilities of every camel. Out of 100 of these animals, 50 may be mature and capable of carrying huge loads; 20 able to carry our standard loads, and the remainder may be young ones, only able to carry a few pounds. They load them up at the best time of the day, that is (if I remember right), late in the evening, and they march all night, going double the distance that we would think of marching a camel. They attend to them very carefully, shifting their loads when they get wrong; they also always have a lot of spare camels, and they shift their loads as they find the camels require rest or relief. They know the temper, power, and qualities of every animal they have, they do this double march, and then the moment they get in they take off everything (making a little camp of the whole of the baggage), and they turn the camels loose, always taking care to halt where there is plenty of grazing. They allow the camels to graze the whole of that day and the next, thus giving them ample time to recover, and get a really good feed. They then start again, and make another double march. The result was that they were able to keep pace with us, and at the same time their camels had plenty of time to feed and rest. This is the great secret of managing camels; they must be given full time to graze on the shrubs of the country, and then they will generally keep in health.

Colonel BAYLIS: Could you tell us the average height of the mules in the Punjab? I have seen at Gibraltar some very large mules. I do not know what may be the height of these mules; are they good serviceable animals for height, capacity, and strength?

The CHAIRMAN: Yes. The difficulty is now rather to avoid their getting too high, as it is no joke lifting the breech of a screw-gun up to a great height. If I remember right they are fourteen hands. There were a number of excellent mules purchased by an artillery Officer in Italy the other day; they were unfortunately extremely young, and are quite unfit for work at present, but in the course of two years they will be excellent animals, though some will, I fear, exceed the height that we wish to get them. The Punjab mules are just as near perfection as anything can be, and the best of them will probably run from 14 to 14.1.

Major JARY, late 12th Lancers: I should like to say one word about the poor old blanket of the British cavalry. I can look back to the time—I am afraid to say how many years ago—when I happened to be on a campaign that lasted three years. In that campaign we had the blanket, and I must say that blanket was a very great comfort to the soldier. In those days, when we were expected to turn out at night, not knowing what was to happen before morning, the blankets were kept folded; but on other nights, when we pretty well knew what the enemy were going to do, these blankets were, with the cloak, the only protection to the men out at night, the luxury of tents being an exception to the rule. The men were perfectly well able to fold this blanket according to the condition of the horse at the time, because there were times when the horses had very little food, and they began to get very hollow in their backs. Of course it was impossible for the saddler with us to think of repadding the saddles on a campaign of the description I am talking of in South Africa; but having the blanket, the men could put it thicker in one place and thinner in the other, to make up for the small declinations there were in the horse's back from starvation; therefore, that blanket had a great deal of use. It is easier, no doubt, to put a saddle on to a horse's back with the padding just the same at the end of the campaign as it was at the beginning, perfectly regardless of the condition of the poor animal's back. I believe in the regiment in which I had the honour to serve we had few, if any, sore backs during the three years' campaign in which we were engaged, and therefore I speak somewhat in favour of the blanket, which is now totally discarded from the British Army. I say the blanket has been, and I believe would be now, properly used, a comfort to the men and the horses, certainly better than the flannel saddle of the present day. That is all I wish to remark upon in this very excellent lecture. It is a long time since I was in the Service, but at the same time I look upon the blanket as an old friend.

The CHAIRMAN: I alluded to the blanket as being useful for the mule or horse, not for the man; I mean to say at night as a protection to the horse.

Major DOUGLAS: I think I have only to thank you for having listened patiently to my paper. As regards the blanket, I think I have said very little against it or for it. The blanket I mentioned was the blanket used to cover the mule at night. I know myself that the blanket is valuable to relieve pressure, as I think I have said in the body of my lecture, but with only one driver to three mules, as we have in the transport services, it is impossible to get it folded and put on properly in the dark. I should prefer not to express an opinion about the blanket for cavalry.

The CHAIRMAN: I think I may express our great thanks to the lecturer for his interesting and fluent lecture upon a very important military subject. Every soldier must know that transport is a matter that is second to none in importance in a campaign; for without ammunition and without food, what can an army do? And these necessities cannot be properly supplied without a good and sufficient transport.

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Friday, May 6, 1886.

ADMIRAL SIR EDWARD FANSHAWE, K.C.B., Member of Council,  
in the Chair.

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THE ADVANTAGES AND DISADVANTAGES OF THE  
DIFFERENT LINES OF COMMUNICATION WITH OUR  
EASTERN POSSESSIONS IN THE EVENT OF A GREAT  
MARITIME WAR.

By Colonel Sir CHARLES NUGENT, K.C.B. (late R.E.).

To those Englishmen,—and I would fain hope that they are the larger portion of my countrymen,—who are convinced that not the prosperity merely, but the very existence of Great Britain depends upon the close and indissoluble connection of the mother country and her Territories beyond the seas, our Lines of Communication with these Territories must ever be a subject of paramount interest.

If some are found to assert that this is a mere selfish feeling on our part, engendered by timid apprehension with respect to our future, we are not careful to attach undue importance to such assertions, self plays an important part in all the affairs of men, and cannot be left out of the account in any matter which interests us and our kinsmen beyond the sea—Kinsmen! yes, in that word is involved the connection—therein lies the bond of union, for they are our kin—we are kin, speaking one language, having one history, exercising one faith, and looking to one future:—these our kinsmen are endowed with the qualities of our race, especially the qualities upon which we set most store, love of freedom in action as in speech, manly self-reliance, honest tenacity of purpose and physical vigour;—for these we love them,—endowed also in full measure with our faults, for these too we love them, nay for these we love them more:—virtue may command admiration, but weakness appeals to our feelings,—and weakness is very human.

For some years the tendency of our Commercial Transactions has been towards our own Possessions and from Foreign Countries,—and it is certain that as the populations increase in these Possessions this tendency will develop further and further, until at length the compacted Empire of Great Britain seated in every part of the world shall be *self-supplying* and *self-sufficing*, the surplus of one part ministering to the deficiency of another, and the redundant popula-



tion of the mother country finding in places and scenes, which however distant are still British, not material well-being only, but the scope for their energies which they have failed to obtain under the fierce competition for existence in the ever-narrowing field of home life.

For three years the commerce of Great Britain has been steadily declining in value,—in 1883 its value was 732,328,641*l.*, in 1885 it was 642,372,000*l.*, a decrease (the decrease however is in value not in volume) of 90,000,000*l.* in three years, this, nearly one-eighth of the total trade, is an enormous decrease, and its effect upon the prosperity of the Empire is accentuated by a steady large increase in population, averaging one-third of a million per annum, and by a steadily rising taxation,—last year it was 2*l.* 8*s.* 6*d.* per head,—which, as means of living year by year diminish, render the struggle for bare existence a burden ever more grievous to be borne.

This decline in the commercial activity of Great Britain is accounted for in many ways,—a period of inflated prosperity inducing a too high style of living,—stimulated over-production causing a glut in the markets, followed by a period of contracted production:—the unsettled condition of matters in Europe, keeping vast numbers of men under arms in idleness, the most unproductive of all laborious idlenesses:—the strained relations between capital and labour,—the financial embarrassments of Great States,—all are said to have combined to lock up capital, and so to narrow the field for enterprize.

In all this there is cause for grave anxiety, but the hopeful feature in the outlook is that during the period our commercial transactions with our own Possessions beyond the seas have steadily increased;—thus while in the ten years ending 1884 Foreign Countries have taken 15 millions less from us, our own Possessions have taken 10 millions more from us, and have given 13 millions more to us.

A considerable portion of this increased business has been in food stuffs, and we may hope that as our Transactions with our Possessions increase we may look to them to supply all our food needs.

To take the case of wheat alone, in the year ending 31st March, 1886, we imported 62 million cwts., of which 24·25 millions came from the United States, 12 millions from India, 5·25 millions from Australasia, 12 millions from Russia, and 2·25 millions from Canada.

In contemplating these figures the first thing which occurs to us is that it should be our aim to be independent both of Russia and the United States, but especially of Russia; it is true that we derive twice as much wheat and flour from the United States, but this need interest us no more than an ordinary commercial transaction as we may hope with reason never again to be at war with the States, while with the settlement of the Red River District, we ought to obtain the wheat we need as cheaply and with as much facility from the Dominion as from the States; but the case of Russia is widely different, popular feeling, which is almost an instinct, and is never wrong, recognizes her as our antagonist; it is not only that her interests clash with ours wherever we meet, in Europe as in Asia, her civilization, her form of Government, her cult, her mode of thought, her

code of morality,<sup>1</sup> her policy military and commercial, are all opposed to ours, and we should be absolutely independent of her:—we should neither buy her food-stuffs nor lend her our money.

In the event of war with Russia, Russian Ports would be closed to our ships, and we should have to look elsewhere for the wheat which we now get from them, and which last year was one-fifth of our external supply.

Where should we look? In a war with Russia the North Atlantic would be our safest sea route, but the trade passing over it is already very large, the greater part thereof is from a Foreign Country, dependence upon which we seek to lessen, and upon the principle of not carrying all our eggs in one basket, it is better to look in another direction.

The only other British Possessions open to us are India and Australasia, and the former seems to offer unquestionable advantages;—it is, as long as the Suez Canal is open, much nearer than Australia, the cost of production is much less, and its capabilities are practically illimitable; for instance, 20,306,798 acres are at present under wheat, and it is only in the Punjab which accounts for 7,819,509 of these acres, that wheat is the food of the people, while it is estimated that in India there are still 100 million acres available for and waiting wheat cultivation.

The staple articles of food of the great majority of the natives of India are rice, pulse, and millet, and the acreage under these grains is 139·5 millions.

It is evidently then very much to our interest to foster the Wheat Trade with India, as by means of it we may be independent of Foreign Countries and possible enemies, while extension of our Commercial Transactions with our Indian fellow subjects benefits them materially.

If it be urged as against India that it is much further than the Black Sea Ports, we may plead that the additional distance is of comparatively little account in the conditions of high steam power and great size which prevail in vessels of the present time, and is more than counterbalanced by the entire freedom from restriction in Indian Shipping Ports, as compared with the vexatious and tedious formalities of Russian Ports and high Russian protective duties.

It may be asked,—how is this Trade with India to be fostered? must it not be left to follow its course, and will it not be regulated by the ordinary law of demand and supply? No doubt it will follow here as elsewhere the ordinary law,—but the course is already Indiawards—this trade with India is only 25 years old, no wheat was exported thence in 1864,—indeed the trade has been mainly

<sup>1</sup> I say nothing of political morality, because I believe she is without political morality. The United States representative at the Persian Court is quoted by the Quarterly, No. 327, page 222, as saying, a Russian gentleman's words to a member of the United States Legation were,—“Believe nothing you hear,—even if you hear anyone swear we do not want Herat, do not believe him,—not even if I swear,—not even if the Tzar should swear, do not believe it. We want Herat, and we shall have it.”

created since '79-80, since when the 2·25 million cwts. then exported have risen to 21 million cwts. in '83-84, of which 10·5 million cwts. were for the United Kingdom;—the export now amounts to 8,000,000*l.* per annum, and it may be promoted by removing restrictions, if there are any, upon its freedom, by judicious advances where necessary to the cultivators, by the extension of railway communication in India. There are two lines of extension which seem absolutely needed, viz., (1), across Scinde and Rajpootana, so as to place Kurrachee in more direct communication with Calcutta; striking the Calcutta Line perhaps near Ajmeer, and so avoiding the long and circuitous route through the Punjab;—(2), from the Eastern Bengal Railway System into Burmah, to Mandalay, and thence onwards at some future day to China;—it is scarcely necessary to dwell upon the great commercial advantages to be anticipated in thus connecting ourselves with China, they are evident; but there is a political advantage in thus tying ourselves to China which must not be overlooked. In the great Eastern Question, day by day shaping itself into a duel between England and Russia, China is a most potent factor, and we should use every effort to retain China upon our side,—China limits the advance of Russia, her size, her enormous population, her compactness, must press with a weight, which may be made crushing, upon the loosely compacted Empire of Russia. She disposes of an enormous army,<sup>1</sup> and is organizing a powerful fleet armed with all the most recent appliances of war, and if not very strong for aggressive purposes, is capable of a formidable passive resistance, as witness the little the French were able to do with them in 1884-85: properly handled China may be the counterpoise to Asiatic Russia, and so I note with regret that not only our Trade here is setting towards our German rivals, but that we have allowed the building of Chinese war ships, and the construction of Chinese railways to pass away from our hands.

Our trade may be promoted perhaps in the most important way of all by a return upon the part of the manufacturers of cotton goods, to the common and old world principles of commercial morality from which, if the reports of British Consuls abroad are to be trusted, they have wandered far of late years. I read within the last few months, that the German houses are pushing British manufacturers out of the China market, and that the Russian cotton goods are supplanting English in the chief cities of Persia; to say nothing of the development of cotton manufactories in India itself; this is of great moment to us as the external Trade of India is advancing rapidly, and the effect of the Suez Canal has been to induce a large Trade between India and the European countries bordering the Mediterranean, especially France, Austria, and Italy.

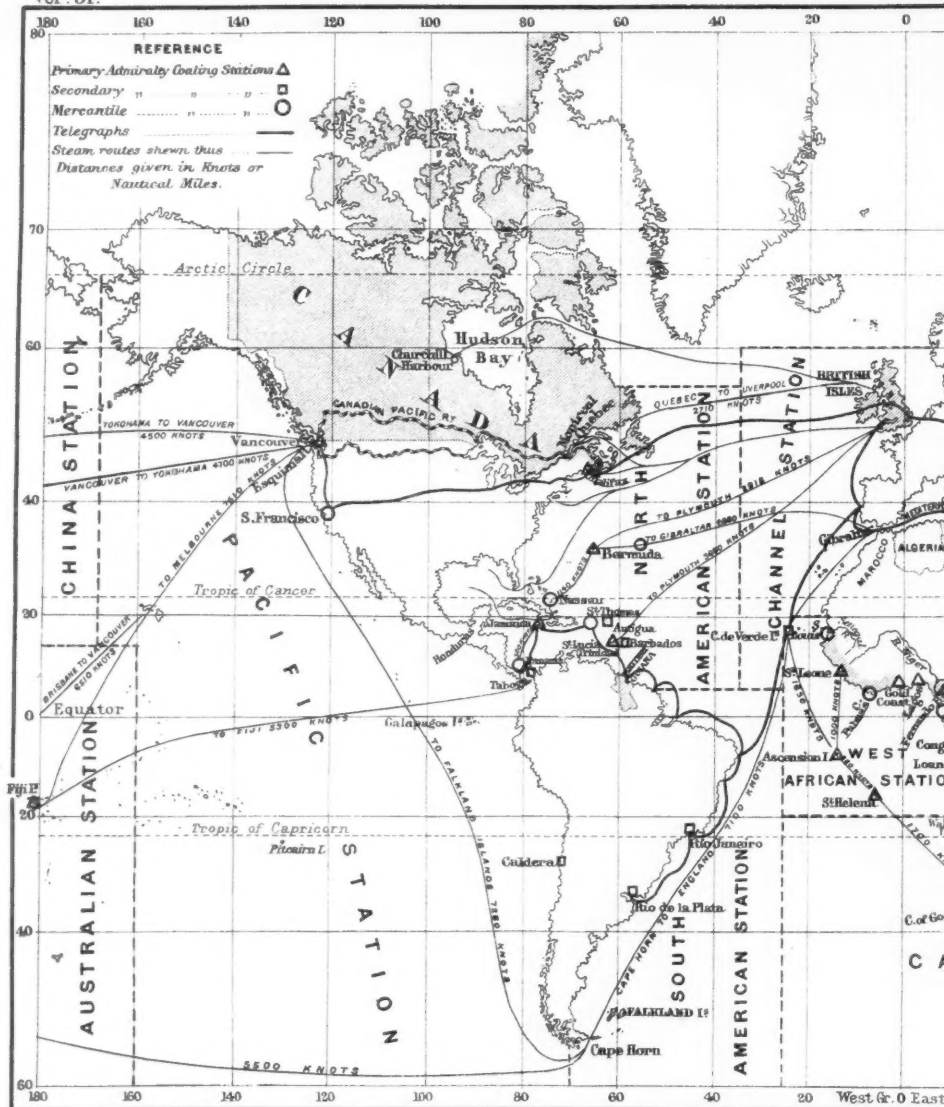
I have perhaps dwelt longer than I should have done upon the food supply portion of our Trade because it is that portion of our trade of which any interruption will immediately make itself most severely felt, and because in any measures we take to protect the food supply

<sup>1</sup> 600,000, at its full strength 1,200,000.

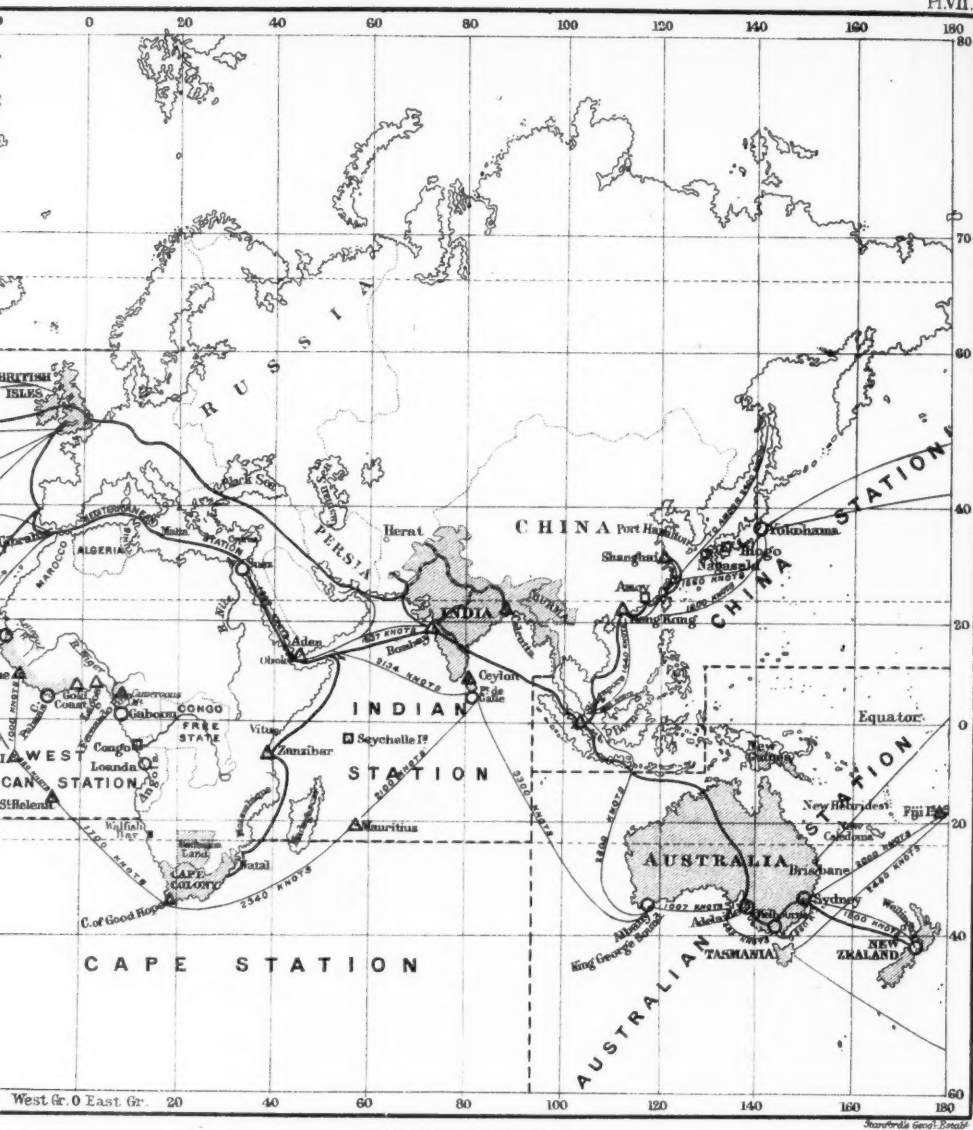
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Country	Value	Unit
Great Britain	24	Million Square Miles
Holland	24	Millions Inhabitants
Spain	8.5	Millions
France	5	Millions
Portugal	3.23	Millions



204-5 MILLIONS INHABITANTS

Scourville, Genl. Ensl.





we shall be doing the best for the protection of the whole of our Trade.

The Trade Routes to our Territories over sea are—

1. The Route by the Mediterranean, Suez Canal, and Red Sea to India, Ceylon, the Straits Settlements, Hong Kong, and Australasia.

2. The Route by the Atlantic Oceans and the Cape of Good Hope, to Australasia, Mauritius, Ceylon, India, the Straits Settlements, and Hong Kong.

This may be called the alternative route to the preceding; or perhaps having regard to priority, and to the possibility of the Suez Canal being closed to us, the Suez Canal should more correctly be called the alternative route.

3. The Route by the Atlantic Oceans, down the East coast of S. America, and round Cape Horn to Polynesia and Australasia.

4. The Route by the North Atlantic Ocean to the Dominion of Canada and through the Dominion by the Canadian-Pacific Railway to Vancouver, and thence by a line of steamers, to be established under subsidy from the Imperial and Dominion Governments, across the North Pacific Ocean to Japan, China and the East.

5. The Route across the North Pacific Ocean to the West India Islands:—this route as we shall see further on may assume considerably increased importance whenever the Canal through the Isthmus of Panama becomes practicable for ocean-going vessels.

Route No. 1, the Suez Canal Route, has very much facilitated our intercourse with India and our other Eastern Possessions, it has shortened the distance to Bombay by thirteen days' steaming, the distance by it to Bombay is only four-sevenths of the distance round the Cape of Good Hope, and it avoids the uncertain and heavy weather often encountered in rounding the Cape. Gradually it has attracted to itself about 75 per cent. of our Trade with India, 90 per cent. of our Trade with the Straits Settlements, China, and Japan, and 20 per cent. of our Trade with Australia; besides this it has induced a Trade<sup>1</sup> (about 15 per cent. of the total Indian trade, say 20 millions) steadily increasing between India and European countries bordering the Mediterranean.

Our Trade with British territories is 190,000,000*l.*,—and nearly one-half of it is with India and our other Eastern Possessions,—of this half 74,000,000*l.* passes through the Canal, as does also 28,000,000*l.* of India's Trade with Foreign Countries, and 9,000,000*l.* of Great Britain's Trade with Australia;—not less than 120,000,000*l.* of British Trade passes annually through the Canal,—of this about 15,000,000*l.* is in the form of treasure.

	Per cent.	£
<sup>1</sup> India's trade with China: Hong Kong.....	8.38	12,000,000
"          "          Treaty Ports.....	2.78	4,000,000
"          "          Australia.....	2.00	2,750,000
"          "          Japan.....	1.97	1,000,000
"          "          Persia.....	..	1,250,000
"          "          Sumatra and Java..	..	750,000

This is a considerable portion of the Trade of the United Kingdom, and at first sight it appears as if the Canal had so established itself as the most facile means of communication with the East, that henceforth Great Britain would never again be able to do without it. This is not an unnatural view, but a little consideration will serve to show that it must be accepted with considerable reservation;—the first thing to be observed is that the Trade through the Canal is mainly with India, Ceylon, the Straits Settlements, and Hong Kong, the Australasian Colonies avail themselves of the Canal to a far more limited extent;—if the Canal were closed, this Trade would not be extinguished, it would find its way by other routes, but by whatever routes it passed India's Trade with the countries bordering the Mediterranean would cease, and would look for a market elsewhere, not improbably finding its way by the Cape of Good Hope to an enlarged market in the United Kingdom or the United States.

The Canal as a Trade Route is then by no means of vital importance to Great Britain,—still we might reasonably desire to retain it,—it is however of great importance as a means of rapid military communication with India, which under circumstances cannot be overrated, at least during the infancy of Australia, though we may look forward to the day, and not a very distant day, when our first reinforcements may reach India from Australia; but in any case our position in India is strengthened if Imperial military arrangements may contemplate Australia and the Cape of Good Hope as places whence in the hour of need, reinforcements may be expeditiously drawn to supplement our Army in India.

Of course this implies free and secure telegraphic communication with both places, there may be considerable difficulty in preserving telegraphic communication in the event of war, and much stress is laid upon this, and no doubt it is a matter which deserves careful consideration, but it appears to me that this difficulty is overrated, the naval measures for the protection of the Trade routes should embrace the great Submarine Cable lines, and as we ought to have, and probably shall have later on, *duplicate telegraphic communication* to all the great commercial centres, we should under no circumstances be deprived in an instant of all the means of Telegraphic communication; at the worst we should be able to make use of them at the outset of war, and so be enabled to set all our forces in motion towards the end we have in view.

I see in the address of the President of the Colonial Congress to the Colonial Delegates that the question of connecting Australia with Canada by cable by the aid of a subsidy from the Imperial Government is opposed by the Eastern Extension Telegraph Company, that is by the *monopolists who have the monopoly*, but this alternative cable is very much wanted for Imperial purposes, would when completed be less liable to interruption by an enemy; we hope the Canadians will not be officially cold-shouldered from their purpose—such a line ought to pay, and capitalists might be induced to undertake it, under a guaranteed interest from the Canadian and Imperial Government.

India is the Possession most affected by the Canal Route,<sup>1</sup> her chief dangers are Russian and Native, yet against Russia alone we ought to be able to keep the Canal open,—the Mediterranean Fleet may be trusted to block her egress from the Black Sea, while by land, for the present at least, the Canal is in no danger from her;—in Indian waters our Indian and Australian Fleets, especially when strengthened by local naval resources, should be able to preserve inviolate all communications, steam and telegraphic. No great danger need be apprehended from the Russian Pacific Fleet—if the Admiralty disposes of its military resources with even moderate foresight, and certainly by no means the least precautionary measure is a judicious addition to the defences of Hong Kong; Hong Kong is the most salient Port in the direction of the Russian Pacific, and it should be thoroughly armed, equipped, and garrisoned, it offers many facilities for strong defence, and should be maintained not only as a refitting place but as a strong strategical offensive position, especially now that it has been decided to abandon Port Hamilton.

Notwithstanding the Report of the Royal Commission of 1879, these Defences have been carried out not in conformity with the recommendations of the Commissioners, or in a mischievously partial manner, and if the Defences in the Colonies have fared better it is because they have been entrusted to local officials who perhaps have had in view something beside politics.

However a better spirit prevails at the War Office,—Hong Kong with three other coaling-stations has agreed to share in the cost of providing defences, and as the contribution of the four stations amounts to 257,000*l.*, it would seem that there would be enough money forthcoming for everything that is necessary.

It has been said that for military purposes the Suez Canal is of considerable importance to Great Britain;—Is it however of such importance as to induce the contemplation of extreme measures for its retention? or what should be the position of the Canal in time of war? Conceivably there are three modes of dealing with the Canal,—1. The Canal may be left as it is, an open waterway;—2. The Canal may be placed under International Guarantee;—3. Great Britain may take charge of it to the exclusion of all but friendly nations. We may dismiss 1 and 2 shortly,—If the Canal be left an open waterway there will be a scramble for the possession of it

<sup>1</sup> The total Transit Receipts in 1885 were 2,488,298*l.*, of which—

	£
Great Britain paid.....	1,911,012
France paid.....	223,946
Holland paid.....	99,531
Germany paid.....	78,132
Italy paid.....	62,257

It is worthy of remark that the Transit Tonnage of war vessels and transports was as follows:—

Great Britain .....	107,146 tons =	·02 of her total tonnage.
France .....	145,161 „ =	·25 „ „
Italy .....	33,326 „ =	·33 „ „

directly war is declared, with the result that the Canal will almost inevitably be rendered impassable. If the Canal be placed under International Guarantee,—who will benefit thereby,—and what will the effect thereof be? We may assume that the intention will be to hold the Canal free to all nations except in respect of such articles as are contraband of war, but who shall say what articles are contraband of war? Even now no two nations are agreed upon this point, and the strongest will have his way in the future as in the past, unless indeed the International Convention which assured the neutrality of the Canal, defined beforehand what is contraband of war.

Moreover International Guarantee can provide nothing beyond a paper guarantee for keeping the Canal open;—accident and design are often so like one another in their externals and results as to be undistinguishable, and supposing that design be established, how and by whom is the guilty party to be punished? Whoever else may benefit by International Guarantee it is quite certain that Great Britain will not, and we may be equally certain that the projects for the neutralization of the Canal of which we have heard so much during the time Sir H. D. Wolff has been at Constantinople will not be to the advantage of Great Britain;—and for my part I have a strong conviction that we are paying this fortunate individual so many thousands per annum for doing badly what our local representatives if they were worth their salt, ought to be able to do better.

And now to come to 3—Should Great Britain take charge of the Canal? She should if she were called upon to do so by the Nations of Europe; there are very strong reasons why she might appropriately assume such charge.

More than three-fourths of the Trade through the Canal is in British bottoms, it is British Trade which has enabled the Canal to pay a Dividend, and without British shipping the Canal as a commercial speculation would collapse to-morrow. Great Britain is a large shareholder in the Canal,—and Great Britain is in the best position for assuming such charge as, while she is as strong if not stronger than any other Power in the Mediterranean, she already holds the Asian outlet from the Red Sea. Perhaps the only Nations which would offer serious objection would be France and Russia, and yet by assuming this charge we should do them no actual injury;—to Russia as far as Europe is concerned it is not of much consequence whether we hold the Canal or not, and in Asia if she were as disinclined to stir up trouble for us in the countries bordering on India as she so constantly and so loudly professes, it would be of even less consequence;—indeed it is matter of notoriety that not very long ago Russia was willing to leave Egypt to British hands in order to secure Great Britain's acquiescence in Muscovite spoliation of Turkey.

To France we should block the road to her Cochin China Colonies, and to the Island of Madagascar with which she has been for a long time so nefariously fumbling, but in reality the situation would be scarcely altered to her, as we already are in the position to block the road at Aden;—French commercial interest in the Canal is after all not so very large, and in spite of *tall* talk about French investments

in the Canal, *a very large portion of the undertaking lay in Egyptian money and in Egyptian labour*,<sup>1</sup>—but France has always allowed herself to be dominated by two ideas, one that she shall be the supreme Power in the Mediterranean, and in recent years in Northern Africa also,—the other that she shall be paramount in Egypt:—we shall always then have to reckon with France, she will never consent to our retaining the control of the Canal, we might however hold it in spite of her at no great cost, at no cost which might not easily be met out of Canal dues if the management were in our hands;—a work at Port Said,—a second at Suez,—a couple of block ships at Ismailia, a few intermediate posts, a patrol of gunboats, and the thing is accomplished.

Casting an eye upon the map of the Mediterranean it would seem that we are in the exact position to adopt this course, Gibraltar and Malta both strong places of the first importance with ample means of refitting, the one holding the entrance to the Mediterranean, the other in the middle of the sea, in the most convenient position for observation or for delivering blows, half way upon the direct line from Gibraltar to Port Said, with Cyprus at the other extremity, which if not yet a strong place may be made so, standing over against the terminus of any Euphrates Valley Line of railway, and most conveniently interposed between the Dardanelles and Egypt;—nevertheless it is doubtful whether the gain is commensurate with the risk, and for my part though I should be prepared to accept it if forced upon me I do not recommend it.

Our true policy, as far as I am able to judge, is to maintain Gibraltar and Malta at fullest strength in men and matériel,—to do what is necessary at Cyprus,—to hold Aden in strength, naval and military, and its harbour offers great facilities for a strong defence, and then to view with complaisance the diversion of the Canal Traffic to the route by the Cape, especially when, having got as we should the start, we have pushed our first reinforcements to India through the Canal before the passage of it was paralysed.

The Canal thereafter would be closed to traffic, the French shareholders would be dividendless, with what consequences may be imagined, while British Commerce when once again it was firmly established on the Cape route would not suffer, on the contrary it would, I think, taken all round gain, certainly the Cape would gain.

There is one other step we should take, though it is political rather than military, and that is we should afford Italy all the support in our power in her measures for establishing herself as a North African Power upon the shores of the Mediterranean opposite to her.

	£
<sup>1</sup> 176,602 shares 12l. ....	3,532,540
Payment withdrawal of fellaheen .....	3,360,000
Pay to others .....	1,526,000
Total .....	8,418,540
Total cost of Canal 16,960,000l.	



No reference has been made to the Euphrates Valley Line as an alternative and shorter, by 650 miles, route to India, because it still is in the region of cloudland from which it has no prospect of emerging;—yet looking at the map one can scarcely avoid speculating upon what had been our position had the projectors of this Line of Railway succeeded in carrying Lord Palmerston with them:<sup>1</sup>—with this Line in existence and in British hands we should have been compelled to bear some part in the Turko-Russian struggle in Asia Minor, in which case Asia Minor would still be free from Muscovite intrusion, while possibly a little English leaven might have leavened the populations of Asia Minor to their advantage, and Turkey thereby stronger in Asia Minor would not have been weaker in Europe;—“The Black Sea would have lain open to British Fleets, and Russia’s Line of Communications with the Caucasus would have been within striking distance;—*the most effective method of protecting India would be to strike at Russia’s Line of Communications, and to harass her coast line in the Baltic as well as in the Black Sea.*” British influence too would have been paramount in Persia,—British manufactures would have flowed over the countries of Central Asia, and the Russian line of advance upon India would have been further to the north and through a less settled and more unfavourable line of country.

This was by no means the first occasion in our history that we suffered a golden opportunity to slip from us,—the first occasion indeed!—the occasions should be noted not by units but by tens, our history as a Nation is made up of such missed opportunities,—again and again has it happened that the opportunity has recurred to us, and has at last been taken by us *perforce*, or almost against our will:—dwelling upon this my thoughts turn to the vast Dominion of Canada with its unrealized treasures of timber, coal, and metals,—its almost limitless resources in grain, in fruits and cattle, to Newfoundland;—to islands in the North Atlantic,—to more southern islands, glowing with fertility but how misused, in the Caribbean Seas;—to the salubrious country of the Cape, so felicitously named “of Good Hope,” the scarcely opened land of wool, of wine, of gold and ivory and of precious stones; to the magnificent Indian Territory, its teeming populations, and its many superfluities out of which it gives us stores of cotton, grain and opium, its rising industries which already yield us coffee, tea and sugar;—with its antique civilizations, its old world histories, its curious customs beside though scarce in competition with the latest forms of Western thought and progress: from which shall issue—What?—a question which may make the boldest statesman pause,—and falter for an answer;—to that vast Australasian island Continent which though the last is not by any means the least bright of the appanages of the Crown, that Continent of fruitful-

<sup>1</sup> It is the more curious that they did not, as in 1840 Lord Palmerston’s policy in supporting Turkey against Mehemet Ali was prompted by the consideration that it was not for the advantage of England that Egypt, the ally of France, should be in position to block the road to India down the Valley of the Euphrates, and to block the road to India across the Isthmus of Suez.

ness, of multiplying flocks and herds, of corn and wine, that land of gold, that land of contrasts and Nature's strange antitheses, that land with room for years to come for Britain's overflowing man- and woman-hood,—that land that at no distant date shall be the Britain in those waters of the Antipodean Seas,—as my thoughts turn and linger proudly upon these achievements of our race, my pride is tempered by the reflection how little these Possessions, which are blessings if we use them rightly, are due to initiative of our own making, how we have seldom seized our opportunities, how with no foresight of our own one step has led to another, and we have been drawn, often against our will, ever onward to the building up this vast British Empire, the like of which the world has never seen.

Surely in all this the most thoughtless must recognize the guidance of a higher Hand. What that Hand may hold in store for us, the most foreseeing cannot picture;—the boldest is unable to forecast Great Britain's future;—Yet the Future takes its complexion from the Past;—in the Past we have been but the humble instruments of the Great Disposer of events, and relying upon His guidance we are resolved to consolidate in the Future what we have acquired in the Past, in the belief that the dominion of the English speaking races is best for the interests of the world.

Let us consider for a few moments the risks to which our Trade by the Cape is exposed;—this is worthy of consideration because under the altered circumstances, so large a portion of it will pass this way;—our position in these seas would be powerful. Upon the Pacific side of the position the combined China and Australian Fleet, resting its left upon Hong Kong, strong in Fortifications and means of refitting as should be to the Station farthest from home and nearest to the enemy, its right upon Sydney with its strongly fortified Naval Yard, should hold all the accesses through the narrow waters of the Chinese Archipelago to the Indian Sea, and should force a hostile Fleet in the Pacific to the south of Tasmania; upon the Atlantic side of the position a strong Cape Fleet resting on powerful defences and ample means of refitting as it will be able to do when the joint defences of Simon's Bay and Cape Town are completed,—the inlet from the Red Sea blocked at Aden,—the East India Fleet free to move in all directions, with strong Bases at Bombay, Ceylon, and Singapore, supporting Stations for coal at the Mauritius and King George's Sound, and with subsidiary coaling places in convenient spots, our Trade might converge to the Cape with as much freedom from risk as may be hoped for in war; nor need we be hampered by Foreign Settlements in these Seas, in the presence of our overwhelming strength they should be sources of weaknesses to such of the Nations which possess them as might be at war with us.

The danger would be to the accumulated Trade after the Cape is passed; the homeward route leaving the Coast at the Cape passes up the South Atlantic, and does not approach the Coast again until the latitude of the Cape de Verde islands is reached; here the route is considerably exposed, for here it approaches European

waters, and hereabouts European Nations have settlements upon the African Coast.

At the Cape de Verde Islands the Trade Route from Cape Horn and by the East Coast of South America joins it, and the two pass together by the western seaboard of Europe to England;—this Route adds comparatively little Trade to the Trade by the Cape of Good Hope. It adds the Brazilian, Argentine, and such portion of the Chilian and Peruvian Trade as does not pass by the Isthmus of Panama, perhaps about two-thirds of their total Trade with the United Kingdom, and a portion of the Australian Trade; not more probably than 40,000,000*l.* all told.

This Trade is exposed to greater risk as it nears Europe, the Western Nations of which lie across it and to some extent bar the approach to the United Kingdom,—as already pointed out a strong Fleet at Gibraltar shuts the Mediterranean and limits the offensive power of possible enemies to their seaboard on the Atlantic: at a pinch the converging streams of Commerce would collect at the Cape de Verde Islands, and then availing themselves of a favourable opportunity run for England: here convoying might come in usefully; hence the Fleets of Merchant Shipping might be convoyed to Gibraltar in four to five days, and Gibraltar kept informed by telegraph from England of the state of the intervening seas would be an admirable breathing place,—moreover this length of 1,200 miles might be patrolled in four or more sections by high speed protected cruisers and fast auxiliary cruisers working in trios (or in greater numbers if greater numbers are available) one protected to two auxiliary cruisers. Gibraltar gained, the rest of the voyage would depend upon the efficiency of our measures for blocking hostile ports. If effectually blocked, the run would be made in four to five days under convoy and a more closely patrolled line.

St. Helena and Ascension are admirably placed, being central between the Cape of Good Hope and the Cape de Verde Islands on the one route, and Cape Horn and the same islands on the other route, upon which route after leaving the Falkland Islands we have only subsidiary coaling places on the South American mainland, and which would cease to be available in war.

From the Cape de Verde Islands (it is a pity these islands do not belong to Great Britain) in case of extremity, the homeward bound Fleet of Merchant Ships might turn to the westward and find its way towards the North Atlantic Trade Route, and so make good its course to the United Kingdom.

The latitude of the Cape de Verde Islands suggests itself as an excellent Patrolling Station.

The North American Station may be divided into two portions, the Southern or West Indian portion, in which the Trade, even when augmented by a fraction of the Trade from Peru and Chili, is not very large,—it draws to itself the Trade of the Central American States and Mexico, and some from the Mississippi Ports, perhaps between 30,000,000*l.* and 40,000,000*l.* in all:—this Trade as it approaches Europe is exposed to the same dangers,—though perhaps in a less degree,—as

the Trade we have been last considering; it is also exposed to the attacks of hostile Fleets based on islands in the West Indies, many of which are in Foreign hands,—the Station, however, is well cared for,—its fortified places are Kingston in Jamaica, Castries Bay in St. Lucia, or they will be, for the Military Authorities are at length awakening from their long and wilful lethargy;—the great Naval Intrenched Camp at Bermuda with its yards and refitting shops, and the fortified yard at Halifax,—and the run across to the United Kingdom would be made relying upon the precautions already described and the protection of thorough local patrols:—here too convoying might be employed with a breathing place at Bermuda, or the Trade might find its way along the American coast to Halifax, and thence across the Atlantic on a Northerly course.

The North Atlantic, or North American portion is the safest of all our Trade routes, except in the event of a war with the United States, and this we deliberately put from us,—Great Britain should go to the extremest limits of long suffering before permitting herself to be dragged into a fratricidal war, for such would be a war with the United States.

The North Atlantic Route,—it is the shortest transoceanic route, it is farthest to the North, and these islands so intervene between it and the most salient European enemy, especially if the Trade passes north about by the north coast of Ireland as to give us a start of some hundreds of miles.

The Trade by this route is very large and very important, a great deal of our wheat, about two-sixths of our total imports of wheat, and one-fifth more than the total import of wheat from our own Possessions, comes from the United States, a considerable quantity also from the Dominion of Canada,—both countries do a large Trade with us in cattle and various other articles, moreover the passage between us has been so shortened in time, that the constant interchange of peoples all speaking the same mother tongue will as years roll by unite us more and more closely.

This route must always be the least open to interference, and of course has an important bearing upon the Canadian Pacific Line as alternative to the Suez Canal Route, of which Line it is the last stage upon the homeward journey.

In favour of this route it is said that the passage by it to Brisbane will be accomplished in 32 days, the time which it takes by the Mediterranean to Adelaide; this is in the anticipation that a fast line of steamers will be established in the Pacific plying from Esquimalt, and that the England-Halifax portion of the journey will be shortened to  $5\frac{1}{2}$  days; the journey across the Continent occupies about  $4\frac{1}{2}$  days.

Let us look at the risks to which it is exposed. It has already been said that the passage across the North Atlantic is fairly safe. The Canadian Pacific Line is for the greater portion of its length in a thinly peopled, or at present not peopled at all, country, and terminates at Vancouver, a position susceptible of strong defence and offering many facilities for a considerable Naval Establishment.

Halifax the other terminal is strongly fortified;—the Line however runs in many places close to the American frontier and with a rough parallelism to it on the westward of Winnipeg till in the last 100 miles it is within a few miles of it;—in many places it might be easily destroyed by raiders from the States, and though we will not anticipate hostilities from the Americans as a Nation, we must not overlook the fact that the Line can be easily cut, and that it is impossible to protect it except at immoderate cost; there is abundance of coal at each end of the Line, in the coal mines of Nova Scotia and of Nanaimo, the only good coal on the Pacific side.

It is not permissible in this place to turn aside to place before you the difficulties of the Canadian Pacific Line, or the energy and fertility of resource of the contractors and workmen, which enabled them to conquer climate, distance, and time; it may, however, be said briefly that ten years were allowed for the construction of the Line; it was completed in  $4\frac{1}{2}$  years—it was commenced in May, 1881, and completed in November, 1885,—trains were running regularly in June, 1886;—in the  $4\frac{1}{2}$  years 2,201 miles including sidings were constructed;—the highest figures reached in constructing the Main Line were  $6\frac{1}{2}$  miles in one day,—21 miles in one week,—92 miles in one month,—and 376 miles in one year;—the total cost was 37,000,000*l.*, or (a very low average) 6,000*l.* per mile (total completed mileage 4,500 miles). Whatever this Line may do, we may hope by the facilities it offers to emigration, the redundant population of these islands may find its way (it can do so in 14 days) to the great wheat growing Districts of the Dominion rather than to the United States: it is said by some that whatever facilities for emigration the Dominion offers, the main stream of Irish emigration will hold its course to the United States. If it be so, we may regard it with a mixed feeling, much of trouble in the States has risen from the Irish in the large cities, the doings of the Municipal Corporation in New York,—the most corrupt municipality of modern times,—the unscrupulous measures for catching the Irish vote resorted to by professional politicians, are repugnant to Americans of the better class;—in the augmentation of this class of the Irish lies much trouble to the States in the future.

Telegraphic communication to Halifax is scarcely open to interference, there is a Line through the Dominion to Vancouver, and as already mentioned, the Canadians propose to lay down under Imperial subsidy a Line from Esquimalt by Honolulu to New Zealand and Australia, which however must be exposed to Russian interference, and must lead to an extension of our Fleets in a direction in which extension has not until recently been considered necessary.

I say recently because it appears from recent statements that the Defensive arrangements with the Australian Colonies comprise the addition to the Fleet in Australian waters of five fast cruisers and two fast sea-going torpedo boats, for the maintenance of which the Australian Colonies will I believe pay 153,000*l.* annually—the first cost of 600,000*l.* being defrayed by the Imperial Government;<sup>1</sup> while

<sup>1</sup> This addition is wanted. The Russians are adding to their Fleet in the Pacific 1 armoured frigate, 2 clippers, and 2 gunboats, raising the Fleet to 12 vessels, viz.,

from the other extremity of this Station it is proposed that the vessels of the Steam Line to be established in the Pacific shall be built under Admiralty Supervision to be convertible into Auxiliary Cruisers, and they will be most valuable auxiliaries to the Pacific Fleet, which with a thoroughly fortified Base and large Dock at Esquimalt, in telegraphic communication with Halifax and England, will be as independent as its Commander may desire.

Now what are the commercial aspects of the Canadian Pacific Line? It is 366 miles shorter than the shortest of the American through Lines of Railway; it passes over easy gradients,—the highest pass on it is 5,296 feet above the sea as compared with 5,563 feet on the Northern Pacific and 8,240 feet on the Central Pacific Lines,—and it is under one control,—This is a great advantage, already the different Companies which make up the nearer American through Line are differing about the reduction of mileage rate to meet the shorter total mileage of the Canadian Pacific, which will be still further shortened 275 and 125 miles to New Brunswick—St. John,—and Nova Scotian Halifax respectively,—when the Line through the State of Maine is completed; but as a link in the Trade route to Australia it involves a double handling of freight, and increased rates for goods over a considerable length of the Route for conveyance of goods must be more costly by land than by sea. In comparing the times by competing routes it must not be forgotten that the times upon which the promoters of this route rely are based apparently upon some acceleration in the rate of steaming of the already very fast steamships of the North American Lines, and upon the establishment in the Pacific of a fast line of steamships, while they seem to give no credit for acceleration or take count only of existing steamships on the Anglo-Australian Lines: of course if these Lines accelerate, the prospects of the Canadian Pacific route will not be quite so rosy as its promoters make it out;—in reality however it is not a matter of distance so much as a matter of trans-shipment, which means loss of time and increase of charge.<sup>1</sup>

The greater Exports from India, exclusive of opium which goes to Eastern Countries only, are grain, raw cotton and seeds, these are all bulky articles, and handling them is attended with much labour, while the Imports are also bulky, viz., cotton goods, silk (raw), metals, machinery, and railway material. From Australia also the chief export is wool, and this route is not likely to supplant the

3 ironclad frigates, 1 corvette, and 4 clippers and 4 gunboats; the effect of dominating Russia in the Pacific will be great upon our policy in India, especially in its connection with China; for every vessel Russia adds to its Fleet here we should add two to ours; and two of superior calibre: one point of superiority in each class is an advantage which cannot be over-estimated.

<sup>1</sup> Since the above was written I have been favoured by Mr. H. Moody, of the Canadian Pacific Railway Company, with a paper in which it is shown that under the lowest of three tenders called for by the Canadian Government for a new Atlantic service, the journey to Adelaide *via* the Canadian Pacific Line will be only 3½ hours longer than by the P. and O. Company,—while to Melbourne, Sydney and Brisbane, it will be 1 day 10 hours, 3 days 2 hours, and 5 days 10 hours shorter respectively.—C. H. N.



Route by the Cape in times of peace ; in time of war it seems to me that the commerce of the East can be collected to the Cape with even less risk than it would be exposed to in crossing the Pacific, nor does the chance of interference become very grave in the South Atlantic, it is as it approaches Europe and in European waters that there is real danger, and it is far more grave here than by the North Atlantic Route.

The Canadian Pacific is an excellent alternative route, it may not possess all the advantages claimed for it for the conveyance of goods, but it is *very convenient for the conveyance of passengers*, and lighter and less bulky goods ; it is a Line which may well be used, and the convenience of shippers will determine the usage. In the matter of distance there is little to choose, the distance to Melbourne by Esquimalt is 1/17th longer than by the Cape of Good Hope, against which must be set the time gained by the overspeed of the Railway, which in a distance of 3,000 miles should make a difference of two days, a difference which must however be discounted by the time lost in unloading and shipping heavy goods.

But however this may be, there can be no doubt but that the possession of this alternative line relieves us of much anxiety with respect to the Suez Canal route, *and leaves us entire freedom of action, so that agreement with other Powers is no longer a necessity, is not even very material* ;—they may do as they like, we can take our own course.

Nothing has been said of the Panama route, because the long distance and heavy traffic from the East has never found its way across the Isthmus, and because the Canal is not yet within measurable distance of being an Ocean Highway. When it becomes a Highway it will no doubt create a Traffic between the Atlantic and Pacific seaboards of North and South America, and between the West India and Pacific islands, but it will be long before it attracts to itself the heavy Australian and Indian Traffic. By this Route the actual distance from England to Melbourne is some 1,500 miles shorter than by the Canadian Pacific Route, but the gain in distance may prove a loss in time, as this additional length and 1,500 miles besides are in the Railroad portion of the latter Route, the travel over which must be more rapid than the passage through the Canal and over the extra length of water.

The recent action of the French in the Pacific is sometimes assumed to be based upon the Panama Canal ;—however this may be, their presence in Tahiti, in the Society and Austral Islands, and in the Low Archipelago upon the flank of our Trade Route between Fiji and Vancouver, does seriously imperil this route in the future ; so too the interposition of her settlement in New Caledonia between Australia and Fiji is of grave inconvenience to us, and as accentuating this inconvenience I confess I view with apprehension the false position she has assumed in the New Hebrides, and from which notwithstanding her professions, she evinces such reluctance to depart.

Bearing in mind that of late France has found, and as far as I know has sought her only ally in Russia, her proceedings should be

carefully watched, and at any rate we must not overlook the fact that in these waters we may have to reckon with two enemies instead of one.

As I write I see a paragraph in the "Standard" (13th April, 1887) to the effect that Spanish Politicians are uniting with Politicians in Central and South America for the formation of a Commercial Zollverein and political alliance to combat the growing influence of the Anglo-Saxon Race in Central America, Mexico, and the West Indies, and in order to keep the Panama Canal from falling into the hands of the United States.

The conclusion at which I arrive is that, in time of war with a great Maritime European Power, the Suez Canal will not be used, two Routes will offer themselves for the Traffic of the East, the Cape Route, and the Canadian Pacific Route, that if the war upon the Ocean lasts or is doubtful, the Traffic of the other Trade Routes, viz., by Cape Horn and from the West Indies will be attracted to these two, which will both be used according to the varying conditions of the war,—and that of the two the Canadian Pacific is the safer.

It should be observed that this will demand a very considerable increase to our Navy, but then we cannot wage a successful war with a first class Maritime Power with our present Navy;—the whole of our Battleships, the armoured portion of it, would find ample employment in European and Home waters, and there would be no Battleships for Foreign Naval Stations. *It will demand also the provision of ample dock accommodation in Eastern, and indeed in all distant, waters; this is being provided at Cape Town, Bombay, Colombo, Melbourne, Sydney, and Hong Kong, and when completed will enable us to maintain Battleships of heavier calibre in these waters than either we or other nations can do at present.* Superiority of calibre with the means of refitting at hand, will relieve Naval Commanders of so much anxiety that they will enter action, or otherwise dispose of their Forces, with a confidence which must go far to ensure success. It is scarcely within the scope of this paper to take notice of the measures necessary to safeguard our commerce from the predatory attacks of fast sailing unarmoured vessels, but this much may be fitly said, that such vessels must be met by vessels of a similar description, and herein we have ground for satisfaction,—our Mercantile Marine has hosts of such ships, and will honour all demands upon it. Recent Admiralty arrangements, wiser than usual, are designed to meet this contingency, and the prospect of such attacks need not excite undue apprehension, the merits of such guerilla warfare are well understood, and patrols of fast steamers would be established at the main Trade Route crossing or converging places.

It only remains to add that in the discussion of this matter, the rôle assigned to British Fleets is by no means its best, something more than mere blockading may be expected from them,—the first blow is half the battle,—this is especially true in these days of large ships and costly armaments, which take years in building and must be few in number, and a reverse at starting might reduce the stronger

Navy to a position of observation for the whole war; the tendency of the hour is to rely rather upon the destructive-from-a-distance qualities of our weapons to the exclusion of the *man element*,—yet the man element counts still as ever for the most—the seaman of to-day is the worthy descendant of his predecessors whom difficulties were powerless to deter from the North-west route to the Eastern World, what those predecessors failed to accomplish by sea we his brothers of the land by a strange irony of fate have fallen upon in developing the acquisitions of the Sieur de la Salle, thereby verifying his prophetic dream of a North American overland route to China and Cathay.

General COLLINSON (late R.E.): As usual with him, Sir Charles Nugent has given us a great many very useful facts and valuable remarks to reflect upon, and which, I think, will remain useful and valuable for a good time to come. I am very glad that he has put the question of food supply in the forefront, because I do not think that that question has received the attention which it requires at the hands of our official authorities. We are now receiving the chief part of our food supply from three foreign nations. What an immense power it would give to one of those nations if we were at war with it, and what a power it would give to the other two if not at war if they were simply neutrals, and we had some political difficulty with them; in such a case they would no doubt take advantage of our war difficulty, and we should go into court with our hands completely tied. Moreover, we must remember what an immense pressure, even after a very short war, would be put upon our Ministry at home to bring the war to a conclusion, even with an almost inglorious peace, for the sake of giving the population their bread. With reference to that food supply, and also for other reasons, I am inclined to concede greater influence to the Suez Canal route than in general seems to be given to it, and the reason why I think it is of exceptional importance to our condition at present is the defence of India. As long as the Russian power was separated from the frontiers of India by the Turkoman barrier, and we found ourselves comparatively secure on that side, the main question with us with respect to the Suez Canal route was our trade, and the defence of our Australian Colonies, and for both those conditions we might look with tolerable complacency on the fact of our not being able to use it in war time. But the case, I think, is completely altered now, if we had to defend the land frontiers of India, because if we got into a war on the north-west frontier of India, that war would not be confined to that part of the world, but would extend more or less over every part of the globe, and not only the home country, but every one of our Colonies would feel the effects of it. Therefore, it is a matter of much more serious importance to us now to secure a direct communication between England and India. If you draw a line from the Land's End to Cape Comorin, on the south of India, the centre of that line is about the Suez Canal. What would be the effect of our being shut out from that line? It is, as it were, the diameter of a circle, and we should have to go round the circumference of it, round the Cape of Good Hope. That would to a certain extent be a question of loss of time, but it is not only the actual time lost in going round, but a great deal more than that, because if we were shut out from the Suez Canal line, and we wanted to send reinforcements to India, or if our ships in the Indian Ocean got seriously damaged, and had to come home for repairs, there would be the whole time lost sending round the communication back from the Indian Ocean round the Cape to England, and then sending the reinforcements or new ships back again; for we might possibly, if we had not the Suez Canal line, be entirely cut off from communication with India. It would be still worse if an enemy got into possession of the Suez Canal, for he would be placed in about the very best possible strategical position for affecting our position in India. He would be in the centre of that short line; he would be able to send his reinforcements or his ships through that line, and to mass them at Aden against any ships we had there in a very much shorter time than we could, and, perhaps, almost without our know-

ledge. He would also have the material and moral influence of being in a central position, and dominating all those countries lying between Egypt and India. For all these considerations I am inclined to think, under present circumstances, it is really quite necessary for us that we should preserve the power of sending our war ships and war material and men through the Suez Canal at all times. How that is to be done is a question for the diplomatists; it is not our business to consider that at all. We are only here to state the result we want to arrive at. There is no doubt in any case even if we did preserve the power of passing through the Canal, there is the danger of its being temporarily blocked at any time, but with power of free passage we should also secure the power of removing that blockage, and I do not think that ought in these days of engineering to be a very difficult matter to do. I think, at all events, we ought to endeavour to secure that right of not only being able to pass our own war ships and men at all times through it, but to prevent any other Power from getting such a control over the Suez Canal as would give them the use of it to our deprivation.

Major-General BABBAGE (late Ben. S.C.): I should like to offer a few remarks on the first part of Sir Charles Nugent's paper, the alternative land routes which would become of extreme importance in the event of a great maritime war. Speaking of the Euphrates Valley line, he has shadowed out some of the possible advantages which we might, if it existed, now be deriving from it, and he laments "how we have seldom seized our opportunities; how with no foresight of our own one step has led to another, and we have been drawn, often against our will, ever onward, &c." Now, it seems to me that the course of events may at no distant date lead or even force us to complete the Euphrates Valley line as part of our overland route to China, and that instead of the prophetic dream of the "North American Overland Route to China and Cathay," mentioned by Sir Charles Nugent, we may have the overland route from Europe through India and Burmah. The Euphrates Valley route has been dreamt of for half-a-century, and that from Eastern Bengal across Upper Burmah for perhaps more than a quarter of a century. I hope the dream may at no distant date come true. The progress of railways in Asia Minor the construction of the Indian railways, the annexation of Burmah with the construction of a railway which must follow shortly *vid* Sylhat and Cachar and Manipore to Bhamo, and the coming construction of railways throughout China; are all important steps, and will leave the Euphrates Valley Railway, and its continuation along the north shore of the Persian Gulf to Kurrachee, the only missing link between Europe and China. Sir Charles Nugent advocates the construction of the part across Upper Burmah, and mentions another from Kurrachee towards Ajmeer, which it has been a matter of surprise to me has not long ago attracted attention with reference to our advance on Candahar. It is the line of course over which all the resources from Madras and the Bombay Presidency could go by land up in that direction, but it seems to have been utterly neglected. The other one which he has mentioned, and which, I hope, will soon be taken up, crosses from Eastern Bengal to Upper Burmah and Mandalay, and every Indian Officer knows the facility which land communication gives us for bringing down our Sepoys, recruits, and so on, by land instead of by sea. I am sorry to find Sir Charles Nugent regarding the Euphrates Valley line as rather "in the clouds," but I take it that is not his own opinion of the merits of the case, but rather what he considers the general feeling of those who do not know better about it. Surely it is no great assumption to say that the recent changes in our position towards China, and our position in Burmah have, or ought to have, changed our position with regard to the Euphrates Valley Railway very considerably, and that the combined Burmese Indian trade which would now flow on such a line would warrant some exertion on our part, and possibly a guarantee of say 4 or 5 per cent. on the capital required; let alone the certainty that at no distant date the trade of China would come to it. With such a prospect the importance of Kurrachee becomes greater than ever. But even now, putting aside the comparatively smaller interests of Bombay, and looking to Imperial interests, Kurrachee is the port of India for intercourse with Europe. It is some fifty hours nearer to Aden by sea; it is situated near the mouth of the Indus, bringing down the commerce of the five rivers; and its harbour is deep enough to receive any ship which can pass the Canal. Its

position lends itself admirably to the strategical advantages of the Euphrates Valley line, especially in case of a great war in which Russia would be a party. Future events might so develop that we should be able, if the Euphrates Valley line existed, to push an army through Persia, so as to threaten, if not actually cut, the line of Russian advance on India, and even launch an ironclad or two on the Caspian under our own or the Persian flag. We should soon get command of the Caspian, and I reckon that would put the Russians in rather an awkward position with reference to advancing through Herat on India. If we were to keep the route ourselves through Afghanistan and garrison Herat, we could not do it under two or three millions a year, but with the overland railway *viâ* Euphrates Valley and Persia to India, we should have the advantage in peace of commercial traffic, and in war we should be able to assume the offensive and to give the enemy a tolerably good blow. I think a direct line of telegraph communication should be set up at once from Calcutta *viâ* Munipore and Bhamo to Peking and China generally, and railways between Constantinople and Kurrachee should be helped and encouraged as much as possible, if not actually guaranteed. Clearly our policy should be to foster in every way we possibly can that line of communication in view of any possible war. Before I sit down I should like to say a word about the neutralization of the Suez Canal. What is the neutralization of the Suez Canal to cover? Is it to cover the neutralization of the passage by Perim? If it is not, what is the use of it? Perim is British land, and by well-recognized international law 3 miles round it is British. That leaves no very great margin of open seaway for other nations. I suppose that no one dreams of neutralizing that, and that we should in the case of a maritime war use our undoubted right to bar the way at Perim to all our enemies. I think a hostile fleet would look rather foolish if they took advantage of the neutralization of the Canal, and then on arriving at Perim had to go back again. The neutralization of the Canal alone, without including the passage by Perim, seems to be an absurdity, and I do not see that it would much matter to us one way or the other.

Captain HALL, R.N., Intelligence Department, Admiralty: There is one point I should like to refer to with reference to the value to us in war time of the Suez Canal. In the case of war with a powerful maritime nation, it would be very difficult for us to protect our trade, not so much in the Suez Canal itself, but on its approach to it from the Straits of Gibraltar in the Mediterranean. In fact the passage to the East is really a passage through a canal of greater or less width, extending from the Straits of Gibraltar to the Straits of Bab-el-Mandeb. In the Red Sea we are practically masters, and should be able to protect our trade properly, but I am doubtful whether we should be able to do so in the Mediterranean. What I am afraid of is that the risks our trade would run in passing through the Mediterranean from the Straits of Gibraltar to the entrance of the Suez Canal, in the event of war with a powerful maritime Power, would be so great that the rates of insurance would be raised so high as to prohibit our trade going that way under the British flag. Sir Charles Nugent thinks that we could hold this route and so protect our trade passing along it by means of a squadron at the Straits of Gibraltar and another one at the entrance to the Red Sea. As regards the passage of our enemy's vessels, we may be able to prevent them going by that route, but he has a little underrated the effect upon neutrals. A neutral ship can pass that way just as well in war time as in peace time. We have no right in war time to stop a neutral except to satisfy ourselves that she is a *bonâ fide* neutral, and with no contraband of war on board destined for an enemy's port. Therefore it is perfectly open to a neutral ship to pass that way in war time just the same as in peace time. It seems to me, therefore, that the effect on our ships passing that way in the event of war with a powerful Mediterranean maritime Power would be this, that they would run such risks in the Mediterranean that the insurance rates would rise, and prohibit their going that route. Neutrals, on the other hand, would be free to pursue that route, and the result would be that they, trading to the East by a shorter route, would have an enormous advantage over our ships, which would be driven to take the route round the Cape. Practically our trade would pass under a neutral flag in order to be able to take that shorter route, and so place it on an equality with neutral nations. For that reason I am inclined to

think that in case of war with a powerful maritime Power the Suez Canal would be of no use to our trade. I would even go further, and say it would be a great advantage to us if we could block it, so that all trade should be driven round the Cape and all then be on an equality. There would be no necessity then for our trade to leave our flag. There is another point, viz, the value of the Canal to us in a war with a country like Russia, which is not a powerful maritime nation. Undoubtedly in that case it would be a great advantage to us to be able to push our reinforcements to the East through the quickest route, but judging from what we saw in the papers at the time of the scare of 1885, I am inclined to think that one of the first things that would happen would be that the Suez Canal would be blocked against us. As Sir Charles Nugent says, accident and design may be very much like one another. It would be perfectly easy for a ship passing through the Canal by a slight turn of the helm to be run on shore and sunk, and if this happened in one of the two rocky places in the Canal the difficulty of clearing the channel would be so great that practically, as far as that war was concerned, the blocking would be permanent. With regard to the question of neutralization, I do not think that that would be of much value. The proposal made by our own Government in 1883 for neutralizing the Canal was to place it under the control of Egypt. We all know that Egypt is not a strong Power, and she would be utterly unable to protect the Canal even if she were warned that it was likely to be attacked. The difficulty of preventing a narrow waterway like the Canal being blocked by what might look like an accident—running a ship on shore—seems to me so great that the only way to guard against it would be for whatever Power was interested in keeping the waterway open to practically seize the Canal and place a guard on board every steamer passing through it in order to prevent foul play. That, however, is perfectly impossible, because no neutral nation would allow her ships to be treated in that way.

Mr. ROBINSON (of Natal): It is with some diffidence that I venture to intrude any remarks of mine upon an audience of this character. But it appears to me that there is some little danger of misapprehension being allowed to exist in regard to the value of the route round the Cape. I should not have presumed to rise at all had it not been for the fact that a long residence in South Africa has enabled me to speak with some little degree of authority upon the subject. The Cape route is by no means beset by the dangers and difficulties often attributed to it. It is in every sense of the term a free ocean highway, and being an ocean highway I think it may be assumed that so long as Great Britain is mistress of the sea, as we all of us believe she will ever continue to be, she has peculiar control over that route. The Mediterranean route, on the other hand, is beset by possibilities of dangers which have been alluded to by the last speaker, because it is environed by ports which might possibly be in the hands of hostile or unfriendly Powers. On the other hand, the Cape route is one along which the coaling stations are nearly all in the hands of England. Ascension, St. Helena, the Cape Colony, Natal, Mauritius, are all British possessions, and all bases from which the forces of Great Britain could operate. The difference in distance between the Cape route and the Suez Canal route is not nearly so great as many imagine. At this moment the mail steamers from England to Cape Town only take an average of twenty days to do the voyage; were they pushed they could do it in eighteen days. The voyage from Cape Town to India could be done in twelve days, or to Australia in sixteen days, and therefore, as a matter of fact, in the event of the Suez Canal being closed, it would be possible for steam traffic to go round the Cape from England to India in a period very little exceeding thirty days, or to Australia in say thirty-five days. And I believe that the difference of time between these rival routes is not so great as to be a matter of commercial consequence in such a case. Sir Charles Nugent makes allusion to the fact that the Cape route is liable to tempestuous weather. Now I have gone many times round the Cape, and as a rule we have more calm weather than we have tempestuous weather. The other day I came from Natal to England: we were twenty-eight days at sea, and you might have paddled a small canoe the whole distance, except when we reached the chops of the Channel. Therefore I do not think that this danger as regards weather is one that can be said to apply to the Cape route. There is the further fact that in Natal there exist enormous coal fields, connected by railway with the port, which ought to prove of immense importance as regards



a coaling station at Durban or Cape Town, or anywhere else on the seaboard. I am glad to be able to state that our Australian friends have expressed themselves in the very strongest manner as regards the value of the Cape route in the eventuality of war. They regard the maintenance of that route as an essential condition of their commercial interests in Australasia, and therefore I would venture to press upon the attention of this influential audience the most vital fact that the Cape route in the event of war would probably be found to be the salvation of British trade and the safeguard of the British Empire.

Admiral BORS: I rise with some diffidence to offer any remarks on this most able paper which has been so well delivered. I was very pleased to hear my friend Captain Hall speak on this subject, and I can entirely endorse what he has said, as I fully believe in case of a maritime war the Canal would be closed and utterly useless to us. In my opinion it must inevitably be so. I just call to mind a circumstance that occurred off Folkestone a few years ago, when the German Fleet were practising manœuvres at close order. On board the "Koenig Wilhelm," an ironclad, the order was given to put the helm to starboard, unintentionally it was put to port, and she rammed another ironclad, the "Grosser Kurfurst," which went to the bottom at once. The same thing might happen in the Canal, unintentionally or otherwise. Any individual man, with a few pounds of dynamite in his pocket, could blow a hole in a ship's bottom, so that she would sink in the middle of the Canal, which if not permanently closed would be blocked long enough to cause immense inconvenience to us. What would be the consequence if the Canal, particularly at the commencement of a war, were only closed a few weeks? Our troopers and store ships would accumulate at the eastern end of the Mediterranean, and might have to come all the way back again and go round the Cape after all. Another thing with regard to the Canal is that at this present moment our largest ships positively cannot pass through it, there is not sufficient water for them; only ironclads built especially for the purpose can get through the Canal. Really therefore our main route to the East in war must be round the Cape of Good Hope. I would only add that every part of Sir Charles Nugent's lecture points to one object, viz.: that whatever route to the East may be adopted, it necessitates a strengthened and powerful Navy to watch and protect it.

Captain CURTIS: Sir Charles Nugent has referred to the Cape de Verde Islands as being very useful in the event of vessels homeward bound. I suggest that one of the Gallipat Islands, to watch the Panama Canal, would be very useful, and would also be a station betwixt Cape Horn and Vancouver for coaling and rendezvous. Sir Charles Nugent says that our courage would be put to the test as heretofore in any future war. The other day I saw some rubinite,<sup>1</sup> and from what I hear it seems that shells filled with it may be fired out of short guns, and that their force is such that they will blow a ship to pieces. Then as to munitions of war, who is to decide what is a munition of war when carried in neutral bottoms? Only the other day the French declared rice a munition of war, and they will declare it so again.

Admiral Rt. Hon. Sir JOHN HAY: In thanking Sir Charles Nugent for his excellent paper, I may point out that there is one trade route to which he has not alluded, which is worth consideration. I mean the trade route to the Baltic, because I hope we should not be at war with all the Powers which are on the flank of the Baltic, and that is a trade route which would be of the greatest importance in case we should have allies in that part of the world. I should like to confirm what has fallen from Admiral Boys with regard to the Suez Canal. Of course you must take my opinion for what it is worth, but I have always thought that the creation of the Suez Canal was a great misfortune to this country. It has shortened the route to the East for

<sup>1</sup> Rubinite is stated to be four times as powerful as dynamite; perfectly safe to handle, and at present can be exploded by a particular kind of capsule. I have seen a three-inch steel plate that had been split in several places quite through by a small quantity of this rubinite exploded on the surface. I was informed that experiments had been performed in Germany with it: no doubt our authorities know of it.

all those who might be our possible enemies and has made our route the longest. Instead of making London the distributing centre for the trade in the East it is now distributed as it comes along the Mediterranean Sea. I believe the very best thing that could happen would be that any useless ship, the instant war is declared, should be sent there and accidentally sunk, so that the Suez Canal might be no longer available. I also entirely concur in what fell from the honourable gentleman from Natal just now; accepting that I must say, having served on the Cape station some time, I am delighted to hear the weather has so much improved there.

General EWART (late R.E.): I rise to say a few words. I think the great advantage of the lecture we have heard to-day has been to bring to our notice that we have several alternative routes; which of those are used in case of war must depend upon our enemies and who are our allies, but the great thing is we should have these different routes to look to. I quite concur, knowing the Mediterranean well, in the difficulties which would arise in holding that line of communication which, as has been truly said, extends from Gibraltar to Aden. The difficulties of guarding that line in case of war would be very great. I should think the difficulty of guarding either of the other salient lines which have been discussed would be far less. Therefore comparing those lines I should think that we might certainly rank as No. 1 the Cape route. But there is one caution I think we should bear in mind; one should recollect in cases of war convoys cannot sail at the same rates that vessels can when they are simply singly pursuing their trade. If convoys are guarded they must be kept together, and in case of fogs they must go slowly. You cannot, therefore, expect to cover the ground in the same time, and I cannot help thinking the difference of a few days under those circumstances cannot be considered very serious. Comparing the Cape route with the Mediterranean route, I went to the Cape myself from Gibraltar and returned by the other route to Plymouth, and I think, roughly speaking, you might take it is about the same distance from Plymouth to the Cape that it is from Gibraltar to the Cape. Therefore, if it became a question of the trade from this country, and the trade from countries bordering the Mediterranean, we should have the advantage if the Cape route were used, and it certainly would be an easier route to guard. As regards the route across Canada, it seems to possess the great advantage that we have it so much in our own hands, and one cannot help hoping that the route may be further developed by good lines of steamers from beyond Esquimaux. I must say, knowing Gibraltar and Malta well, and the Mediterranean well, I concur most entirely with Sir Charles Nugent that we should keep Gibraltar and Malta as thoroughly good reliable places of arms, and Gibraltar is valuable not only if you use the Mediterranean route but also if you use the Cape route. I have been Commanding Royal Engineer at Gibraltar, and therefore I know Gibraltar well, and I know that it is a place whence vessels can issue to meet fleets or to close the Straits.

Major-General DUNNE: While so much is said about the Cape route, I may, as an old Officer who served there years ago, remind you of this, that the south-east coast of South Africa much wants secure ports into which our vessels could enter. At Natal at the present moment I do not think any ship of any size could hardly get across the bar. Port Elizabeth too is quite insecure. There is no place to defend our line of trade from which a man-of-war could issue. So that it is of vast importance, if that route be taken for the future, that more attention should be given to the points at which our cruisers could rest along the coast.

The CHAIRMAN (Sir E. FANSHAWE): I should not wish to occupy the time of this meeting with making any observations on the subject which has been so thoroughly well put before us in the paper, and so thoroughly discussed afterwards, particularly as regards the Suez Canal and the alternative route by the Cape. The lecturer incidentally mentioned, with reference to the telegraphic line across the Pacific, the opposition of a monopolist's company which has already got possession of the ground. I think that on all the routes by which our commerce and our munitions of war will be sent in war, the Government ought to ensure that there be telegraphic communication in order that proper information may be conveyed. We trust in this matter too much to purely commercial enterprise, and look upon telegraphic communication as a commercial business exclusively. Even so important a fortress as Bermuda, between 2,000 and 3,000 miles from the coast of England—

the principal naval station on that side of the Atlantic—has, or recently had, no telegraphic communication with England. Again, the Zulu War broke out very much against the wishes of the Government of the day, although we had on the spot one of the very best administrators this country has ever produced. But he could not be made acquainted with the intentions of the Government, because there was no telegraph. When we moved our troops from the Cape, it never occurred to the Government that we should put it in telegraphic communication with England, as an Imperial necessity; it was left to itself, and therefore that Zulu War commenced although it was the avowed desire of the Government of England at the time that it should not then break out. I think it should be a fixed principle that in all great routes to be traversed in war, there should be telegraphic communication. Although our lecturer went rather fully into the Canada route, with reference to commercial matters, I do not think he touched upon the military advantages we might derive from it in case of war, in the conveyance of troops and munitions of war. I do not think that was included in the lecture, but we all must recollect that last week Lord Harrowby made an excellent speech in the House of Lords on the subject, in which he mentioned some negotiations now going on with Canada. But one reason for the great regret I feel that Lord Carnarvon is not here at this moment is that he also made a very excellent speech on that occasion, and is therefore well acquainted with the subject. Those speeches referred more particularly to the military aspect of the Canadian route. Admiral Boys mentioned what was in my mind all through this discussion from the time I read the paper, viz., how completely it is impregnated throughout, like all questions that arise concerning our Imperial interests, with the necessity of an overpoweringly strong naval force for the British Empire. I do not know that any discussion here or elsewhere has shown this more completely than the paper Sir Charles Nugent has read to us. I will now ask Sir Charles to answer any points that he may think necessary.

SIR CHARLES NUGENT: I do not know that there is much that I am called on to answer. I am sorry that I should differ in any way from my old friend General Collinson, because there is no person whose opinion I value more highly than I do his, on matters of this kind; but still, having heard what he has said, I cannot depart from the position I have taken up, and he has not convinced me that the Suez Canal is of vital importance to Great Britain—that is my point. In fact I agree with Sir John Hay, and what he has told you is very clearly put forward in Mr. O'Connor's report upon the trade of India, where, after summing up the advantages India has derived from the Canal in the extension of her trade with countries bordering on the Mediterranean, he goes on to say that the balance of advantage of the Suez Canal may not be in favour of this country. General Collinson says that we should suffer greatly from our inability to pass ships of war through the Canal. But if you will look at the statement in footnote, page 4, you will see that Great Britain has nearly eight-tenths of the whole trade of the Canal; then comes France with only nine-hundredths of the trade of the Canal: the tonnage of course goes with the trade in each case. But when you look further you will see that the percentage of the transit of our war vessels through the Canal is only one-fiftieth of our total tonnage, whereas the percentage of the war vessels of France is one-fourth of her total tonnage; therefore France, as compared with her total tonnage, depends much more on the facility she obtains by the Suez Canal to pass her war ships to the East than we do. Moreover, we are in this position: we have fleets in every part of the world, and as a rule maintain them in far more equal strength than do other nations. If the Canal is closed, and I would be not unwilling to block it up at once, the gain to this country would be great, anyhow the comparative gain would be, for France would suffer more than we should. She would be entirely shut out from Cochin China. We should have no necessity for stopping her at Aden, she would be stopped at the Canal. As regards the Cape, no doubt I did not say anything about the coalfields, but I have on previous occasions in this room in dwelling on the defence of the Cape drawn attention to the quantities of coal available at the Cape, and to the railway communication between the coalfields and the shipping ports. With regard to what Mr. Robinson said, I thoroughly agree we might have more stations at the Cape. However, in selecting stations you have this difficulty confronting you at once, you have to keep the

number of your stations as low as possible with efficiency, if you augment your stations they become in a certain way points of weakness. Directly you get one more than you want, it is an absolute point of weakness. Of course I need scarcely say that as Captain Hall's observations practically were in contravention of what General Collinson has said, I agree with Captain Hall. Referring to what fell from General Babbage, I am indebted to him for what I have said in favour of railway communication with China. I did not know till he told me that he had persistently advocated the value of a line of railway extending from the eastern railway systems of India into China. No doubt I did make use of the expression that the Euphrates Valley line was at present in the region of cloudland, for our position here is nothing like as real as it was when the formation of the Euphrates Valley line was projected by General Chesney; it seems to me that we are in a less likely position to make a line of railway in that valley, and with it a telegraphic line, than ever we were; at the same time I cannot fail to see all the advantages of such a line. If the Chairman will look at my lecture I did say that the Canadian Pacific Railway was very convenient for the transit of passengers and goods, and when I said that, I intended it to embrace, as might be advisable, troops and Government stores. I express regret if I stated it in insufficient terms. There is only one other point upon which I would dwell, and that is, the absolute necessity of more than single telegraphic cable communication with all these places. It is a most important point, and I hope that the Dominion Government will succeed in establishing a line of telegraphic communication from Esquimalt to China and the East.

The CHAIRMAN: It only remains for me to ask you to allow me to thank in your name Sir Charles Nugent for his excellent paper, not only excellent in itself, but which has given rise to a discussion which I am sure has been very instructive to all of us.

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Friday, May 13, 1887.

ADMIRAL THE RIGHT HON. SIR JOHN DALRYMPLE HAY, BART.,  
C.B., &c., &c., Vice-President, in the Chair.

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### THE OFFICERING OF THE MILITIA.

By Colonel G. G. WALKER, Commanding 3rd Battalion King's Own  
Scottish Borderers, A.D.C. to the Queen.

I DO not anticipate that any of those who have done me the honour of coming to listen to me to-day will expect an apology from me for endeavouring to attract some measure of public, and especially of military, attention to a most important, nay a vital point in connection with our existing Militia system.

Those who have studied the history of the Militia know that questions of its organization and efficiency were often the subject formerly of long and important struggles in the Legislature, and decided the fate of Ministries. No one will, I think, assert that at the present day the force usurps too large a share of public attention, either in Parliament or in the public press. The reasons for this are not far to seek. There is nothing in the humble and unostentatious duties which it has to perform to attract public interest. It has no share in the popular enthusiasm which is so strong a stay and support of the Volunteers.

However natural this may be, it is not, and cannot be, desirable that public opinion and public criticism, ever busy with the other branches of our military service, should be almost if not altogether silent as regards the Militia. Numerically weak as our first line must ever be in comparison with the hosts of neighbouring nations, it cannot but be important that the nation should know how far its second line is reliable; how far the 134 infantry battalions and 25 artillery brigades comprising the Militia are fitted for the duties they may be called on to perform.

I cheerfully and thankfully admit that a great deal has been done to improve the drill and the efficiency of the rank and file of the force during the years succeeding its reorganization by the late Lord Cardwell, and in the permanent staff the Militia possesses a most invaluable nucleus and element of strength. But I venture to



think that what the country requires in the Militia is, not merely so many thousand individuals, more or less thoroughly instructed in drill and the use of arms, but so many battalions and brigades, strong in discipline, in subordination, in that cohesion and solidity which spring from local connection and historical unity. It is an old familiar saying, and one entitled to all respect, that the non-commissioned officers are the backbone of a regiment; yet this principle must not be pushed beyond its legitimate conclusions. We must not close our eyes to the fact that, however invaluable are the services of non-commissioned officers, it is to his Officers that the British soldier ever has looked, and I trust ever will look, for example and guidance; that the Officers are the cement to which we must trust to temper and weld and bind together our fine material into that model military machine, a British regiment. And from this point of view it becomes a question of capital national interest how far the efficiency of the Militia is sufficiently provided for, both as to the numbers and as to the military instruction of those holding commissions.

As there is, I believe, among the public generally a considerable amount of ignorance on both these points, it may perhaps be well to say in a few words what is the position, what are the duties and responsibilities of Militia Officers. They are for the most part, putting aside those young Officers who join the force solely in the hope of obtaining commissions in the line, members of what may be called the leisured classes, men whose position is sufficiently independent to permit of their devoting at the least four consecutive weeks of every year to their military duties. During this period they receive pay and allowances, which however are insufficient to meet the various outlays involved. Further, they subject themselves permanently to the Mutiny Act and the Articles of War, and they cannot leave the United Kingdom at any time without leave of absence.

But it must be observed that the above are the *minimum* claims upon their services. In addition to these, they take upon themselves additional and very serious obligations.

The annual period of training may be extended from 27 to 56 days. And further, in case of war or national emergency, the whole or any portion of the force may be permanently embodied. And it must be remembered that these are not merely illusionary conditions of service, and that the liability is a very real and practical one. The period of annual training has been frequently extended for various periods beyond the customary four weeks; it was increased, for instance, from four to six weeks in the case of those Militia battalions which were called on to participate in the autumn manœuvres of 1871, 1872, and 1873.

Again, when in 1881 this country was largely depleted of regular troops by the expedition to Egypt, which culminated in Tel-el-Kebir, it was thought prudent, in order to have some reserve in hand, to extend from 27 to 55 days the training of 26 battalions of infantry and 2 batteries of artillery.

And it has been usual in recent years to prolong also the training of various artillery brigades, to permit of their being moved from

their headquarters to stations admitting of more extended artillery training. Similarly the trainings of the various corps of engineers and submarine engineer Militia have been extended from time to time.

Permanent embodiment is of course a much more serious claim on the Officers than the most prolonged period of annual training. Embodiment simply adds the Militia for an entirely indefinite period to the standing army of the country, with the single limitation that it cannot be employed outside the limits of the three kingdoms without its own consent, a consent which has once and again, when required, been most freely and enthusiastically given. Embodiment has again and again been resorted to. The Militia was first permanently embodied in 1759, and remained under arms for four years. It was again embodied in 1778, in consequence of the American War; it was disembodied in 1783, after five years' service. Again, in 1798 the Militia was permanently embodied, and after a very brief interval, consequent on the Peace of Amiens, was again called out and continued under arms till the conclusion of the great struggle against Napoleon in 1815. The embodiment of the Militia followed immediately on the commencement of the Crimean War in 1854, and, though disembodied after about two years' service, in 1856, the outbreak of the Indian Mutiny called a large portion to arms in 1857, and they formed the main portion of our home garrison for upwards of a year, some being disembodied in the autumn of 1858, while some were not dismissed to their homes till the end of 1860.

From that date to the present day this country has not been engaged in any struggle of sufficient magnitude to necessitate any general embodiment of the Militia, although in 1884 the large demand for troops for the second Egyptian Expedition made it desirable to call out 6 battalions of infantry, and 3 brigades of artillery, Militia, which did duty for seven months at Aldershot and our large garrison towns. And nothing can be more certain than that the outbreak of war on a large scale will always be the signal for the embodiment of the Militia, and that the Officers must at all times hold themselves in readiness to abandon their ordinary pursuits and avocations, and to devote themselves, it may be for years, to the active service of their country.

I have gone into these details in order to combat a very general misunderstanding as to the nature of the duties and responsibilities which Militia Officers undertake; there is a popular idea that a few weeks' annual training, degenerating into a sort of gigantic picnic, is the limit of what is expected from them: I shall have occasion at a later period to go into some details as to what is the amount of work and duty exacted during training. Meantime I claim to have established that gentlemen accepting commissions in the Militia accept with them very grave responsibilities.

Rightly or wrongly, this country has chosen to base its entire military system on the voluntary principle: it is absolutely optional with our countrymen whether they will in one form or another give their personal services in the defence of their country. Whether this principle will or will not prove inadequate when the evil days come

upon us, as sooner or later come they must, may be a matter of conjecture: we can only hope that it may prove adequate, if every grade and class of society becomes permeated with a sense of national responsibility, if the basis of volunteer service becomes so general and broad that all degrees of men shall contribute their quota, according to their station, to the general force. Looked upon from this point of view, I venture to think that it is a matter for some congratulation that our Militia system has enabled the country to tap a source of supply which otherwise might have remained unused, and to contribute to our defensive forces some thousands of gentlemen, drawn very much from the same social stratum which mainly officers our regular Army, men who not only have the will, as I trust the great majority of our countrymen have, but who are able, from their personal circumstances, to devote long continuous periods of their time to military duties. I venture to think that this country stands absolutely alone in the possession of a class of men, numerically I believe very large, on which it may draw for those important purposes, and that we should do well to develop to the highest degree its powers of usefulness.

And now I turn to the consideration how far the services of this class have been successfully utilized, and how far it has been found possible, both as regards numbers and efficiency, adequately to supply with Officers our Militia forces.

The total establishment of the Militia comprises 130,000 rank and file, inclusive of the men of the Militia reserve, and these are distributed among 134 battalions of infantry, 35 brigades of artillery, and 11 companies of engineers and submarine miners.

The establishment of Officers for these may be put down as a Lieutenant-Colonel and two Majors for each brigade or battalion of not less than eight companies, one Captain per company, and a proportion of one subaltern and a half per company.

The total number of Officers borne on the establishment is 3,561, or about one Officer to 40 men.

It will not, I venture to think, be contended that this is an excessive proportion of Officers to rank and file; some might consider it insufficient numerically for the command of a force composed for the most part of men only partially drilled and disciplined. Unfortunately, however, very serious deductions indeed would have to be made from these totals in case of a sudden call for the services of the Militia. Practically it has never been found possible to maintain the full establishment of Officers in recent years; the deficit varies from year to year, and has tended greatly to diminish during the last quarter of a century: during the year 1867, from a Return moved for by myself in the House of Commons in that year, it amounted to no less than 1,219. From that alarming figure to the deficiency for the present year, supplied to me through the courtesy of the Adjutant-General for the Auxiliary Forces, amounting to only 443, there is a very wide stride, and it is satisfactory to know that the progress has been gradual, and promises to be continuous. Still the existing shortcoming is all too large, and unfor-

tunately it does not stand alone. Besides the mere blanks in the Army List, there are other very considerable deductions that must be made from the paper effective.

There must always be a certain proportion of Officers, comparatively small, I believe, yet considerable in the aggregate, who are able to carry on their annual trainings, but who, on a call for embodiment, would be reluctantly compelled to retire by considerations of age, failing health, or urgent private business.

Again, there are upwards of 200 Militia Officers holding also commissions in the Reserve of Officers; it seems certain that, in case of serious hostilities, this class must be very freely indented upon.

We must also consider the calls likely to be made upon the Militia for Officers to do duty at the regimental depôts. As many as 100 were thus employed during the earlier portion of the occupation of Egypt.

Lastly, it must be remembered that a very large proportion of the young gentlemen filling the subaltern ranks are candidates for line commissions, that the number of these is likely to increase, in consequence of the recent extension of the age for candidates from twenty-two to twenty-three, and that the outbreak of war would be certain to sweep a very large number of these into the regular Army, while other adventurous spirits among them would be pretty certainly attracted to some improvised auxiliary forces, such as the Osmanli Horse, and the various foreign legions of Crimean times, or the field forces recently raised by Colonel Methuen for South African service. Altogether I consider that it would be very rash to calculate the actual deficit on embodiment at less than 800 Officers, a shortcoming which, if not actually alarming, is still serious enough to demand the utmost vigilance on the part of the military authorities. I am of course perfectly well aware that in a grave national emergency it would be found possible to fill up these blanks with young gentlemen who might in time make useful Officers. I am old enough to remember how promptly this was done in 1854 and 1855, on the outbreak of the Crimean War: but I also remember (for I was one of them) how utterly ignorant these improvised Officers were of their duties, and how slowly, and with what faltering steps, by dint of good will and hard work, their regiments emerged from chaos into a high condition of discipline and efficiency. And therefore I consider it of the most vital importance to minimize at least the deficiency of Officers. I am firmly convinced, and I believe that the experience of other Militia Commanding Officers will confirm the opinion, that there is an ample supply of the proper material in the country, that our public schools and our universities turn out every year large numbers of the very best material in the world for Officers, men, too, who have the leisure, if they have the will, for the required duties: there is probably not one among us who could not at once name two or three young fellows within his own circle of acquaintance who, while they can find ample time for hunting, shooting, cricket, the amusements which are in some sort the natural training of the British Officer, yet who, if asked to take a Militia commission, will

reply in the language of the day, that, "it isn't good enough." It is all very well to deplore this, but let us be fair, and let us ask ourselves what we have to offer him. Let us look into the ordinary military life of the young Militia Officer. His first experience is in most, and should be in all, cases, twelve consecutive weeks of hard drill at his regimental depôt, or at the headquarters of his own battalion. To this he may add four weeks more of hard drill at a school of instruction (eight weeks, if belonging to the artillery or engineer branch), or he may be attached for a similar period to a line regiment. After this his military life becomes simple in its bald monotony. Some time in the early summer, when the London season is at its height, he repairs to some dull country town, the headquarters of his battalion, and then, in camp, in barrack, or even in billets (for that pernicious system dies hard), he goes through with dreary iteration his annual training. His actual work is limited from want of time, and also too frequently from insufficient drill ground, to a dreary mumbling over the dry bones of company and battalion drill, varied by a desperate scramble through the course of musketry, ending with the stock inspection, conducted by the same Officer, on the same parade, where every daisy seems an old familiar friend, and on which the hole in the ground for the staff of the saluting flag is an ancient institution. With this and the worry and anxiety of paying off and dismissing his company, his military year is peremptorily closed; he has absolutely no opportunities of extending his knowledge of his duties. For him there are no Easter Reviews, no marching columns, no Wimbledon or Shoeburyness encampments. If he goes to Aldershot to watch brigade or divisional field days, he only shares with the civilian spectator the privilege of being hunted by the mounted provosts. Some years ago, indeed, there was one small break in the barrenness of his duties; in those days a very limited number of Militia battalions were permitted to attend the autumn manœuvres, and I am very sure that those of my audience whose battalions were fortunate enough to share this privilege will confirm me in saying, that the beneficial effect on their men, and more especially on their Officers, was immense: it not only gave them self-confidence in acting under conditions and circumstances that were new to them, but it opened their eyes to the fact that the whole art of war was not confined to the formal parade movements to which their own experience had hitherto been limited, and gave them a new and wider interest in their duties. Since then, unfortunately for the Militia, it has been discovered that the British Army, alone among the armies of Europe, is able to dispense with autumn manœuvres; the last attempt in that direction, following on the manœuvres of 1883 at Dartmoor and Cannock Chase, was the mobilization of the 1st Army Corps in 1886. Since that date autumn manœuvres have been discontinued, and with them disappeared for the last fourteen years the only opportunity beyond his annual training open to the Militia Officer of adding to his military knowledge and efficiency.

I don't mention these matters in any grumbling spirit of complaint. Some of them are probably inseparable from the nature of the Service:

others doubtless our military authorities would be only too glad to remedy, if they had not the ever-present fear of the Chancellor of the Exchequer before their eyes. I mention them because they exist, and because they must be reckoned with in considering the sufficient or insufficient supply of Officers to the force. For myself I am bound to say that, considering the duties expected from, and the calls made on, the time of the young Militia Officer, my astonishment is not that there are so few candidates for commissions, but that there are so many, and I think it is creditable to the class from which they are drawn, that it is able to supply the large annual contingent that it does. I speak advisedly of the *young* Militia Officer, for it is one of the most satisfactory features in the force that, once a young fellow joins, he as a rule, unless a candidate for the line, sticks to his regiment and to his work with a spirit and a determination to put the thing through which does him infinite credit. The tenacity, in fact, with which Officers, having once joined, adhere to the Service, is sufficiently indicated by the very large number of Captains holding the honorary rank of Major for length of service.

It seems to me a most shortsighted policy to endeavour to minimize the evil effects of the deficiency of Officers by the allegation, true so far though it be, that it exists almost entirely in the junior ranks. It must be kept in mind that a deficiency of three or four subalterns in a brigade or battalion, though it may seem a small thing to-day, must some few years hence represent a deficiency of properly trained and experienced Captains. No one will, I think, contend that the regulation which insists that subaltern Officers must have served for three trainings before becoming eligible for promotion to the rank of Captain errs on the side of stringency; yet on January 1st of this year there were not fewer than twenty-four brigades or battalions whose junior subalterns' commissions dated no further back than January 1st, 1885, and which consequently had not a single Officer among them available for promotion. To take individual instances, I could point to a battalion of ten companies, whose senior subaltern's commission dated only as far back as the middle of last May, or to a two battalion corps, in which the senior of twenty-four subalterns dated from the middle of May, 1884.

I have, I think, said enough to show that the present deficiency of junior Officers, though not so generally alarming as it was some years ago, is still very serious, and that, unless checked, it must irresistibly develop in a very few years into a greater mischief, namely, a deficiency of properly qualified commanders of companies.

I am quite aware that a great deal has been done to induce young gentlemen to join the Militia by opening very wide the portal to the Line through the Militia. This has doubtless filled many blanks for the time, it has in some sort converted many battalions into preparatory schools for the Line. But I venture to think that a battalion should rather be a school for educating its own than other people's Officers, and that a system cannot be entirely right, which fills up the junior ranks with young gentlemen whose first ambition is to pass into a different service.



Little has been done to attract to the force the class really and permanently useful to it, those who, while they like soldiering, have no intention and no occasion for making it a profession.

I have already expressed my belief that they exist in sufficient numbers; I believe further, that it is not, or ought not, to be impossible to attract an increasing proportion of them to the Service.

If I am asked how this is to be done, I can only give my opinion, for what it is worth, that it is not to be accomplished by tailoring and fine titles. It appears to me, that for some years back our rulers have, unconsciously perhaps, adopted, as regards the Militia, the same policy which was pursued towards the regular Army during the long interval between Waterloo and the Crimean War. That policy, a most mistaken one, as we afterwards found to our cost, was to treat the Army as a necessary evil, to hide it away as far as possible in out of the way corners, to avoid all military displays which might attract to it the notice and attention of the country. We know the result: the Army lost all touch of its countrymen, it was generally viewed with an ignorant dislike and suspicion, which thirty-two years of a wiser and more generous policy have only partially dispelled. Similarly the Militia is hid away in corners now, it attracts no share whatever of the public interest, which is now so largely and intelligently bestowed on other branches of our naval and military forces, and though on the few occasions on which it is the subject of discussion in the Legislature, or in public, it is often made the mark of ignorant and hostile criticism, it is very rare to see a manly defence of it offered by those who know it best, and whose opinion would carry weight in the country.

The Militia is not a perfect force: were it so, I should not be taking up your time to-day. But it is a force which has rendered great services to our country in the past, and is capable of doing so again in the future. If it is desired to attract to its ranks the young gentlemen of England, the best material for Officers, as I believe, in the world, you must invite them to join, not a force which is looked on and apologized for as a necessary evil, or is at best tolerated as a convenient mechanism for recruiting the regular army, but as the second line of our defensive power, to which the country looks confidently for most important service, and on which in return it bestows ungrudgingly its respect and sympathy.

Thus far I have endeavoured to deal mainly with the numerical part of the question, as to how far the supply of Officers is sufficient in number: I shall now, with your permission, approach the question of quality as distinguished from quantity, the question how far the gentlemen at present officering the force are efficient for the performance of their very important duties. It might of course be very interesting, as an academic study, to create on paper a new system, by which all the Officers of the Militia should be as thoroughly educated for their duties as those of the Army: but we have to deal, not with theories, but with things as they are, and we must make the best of them, and improve them if we can.

Owing, as I believe, in great measure to the policy of keeping the Militia in the background, there is an immense amount of ignorance and misapprehension prevalent as to the officering of the force. It is a matter of common belief, that country gentlemen, ignorant of the rudiments of military duty, are habitually pitchforked into the higher ranks, and that the command of brigades and battalions is frequently bestowed on individuals whose only qualification is the possession of a coronet. And in view of these fables, I trust that those present belonging to the Militia will bear with me, while I very briefly recapitulate, not for their information, but for that of others less acquainted with the subject, what are the conditions attached to appointment to, or promotion in, the Militia. I may say that I shall not touch on the question so far as it relates to those Officers who have previously served in the regular Services. Their value is admitted on all hands, and I confine myself to the case of those who enter the Militia without previous army service. A candidate for a commission must produce satisfactory evidence of his personal character, and a medical certificate of physical fitness for military service. Should he be appointed, he must pass, before the end of his second training, an examination, conducted by a Board composed of Officers of the regular Army, in the duties of a subaltern Officer, both in the field and in quarters, including the special requirements of the arm of the Service to which he belongs. Should he fail in this examination, he is allowed one other chance within six months, non-success in which involves the resignation of his commission. Having passed this preliminary examination, the young Officer is not eligible for promotion to the rank of Captain until he has actually served for not less than three annual trainings, and then only after passing before a similarly constituted Board a very thorough examination in company, battalion, and extended order drill, in interior economy, Queen's Regulations, the Militia Regulations, and the special requirements of his arm of the Service. It has been considered unnecessary to lay down any minimum term of service in the rank of Captain before becoming eligible for promotion to field rank, because practically promotion becomes clogged as the higher ranks are approached, as is testified by the fact that in the very large majority of brigades and battalions there are Captains, in some five or six, in one no less than seven, serving with the honorary rank of Major, which implies a minimum service of fifteen years. A further examination, however, must be passed, conducted as before, by a Board of Officers of the Army, thoroughly testing the candidate's qualification for field rank, and comprising riding, the command of a battalion or brigade, duties of advanced and rear guards, orderly room work, official correspondence, and various other subjects.

No examination is required for promotion to the rank of Lieutenant-Colonel; and very rightly so, for an Officer who has attained, for some years held, field rank, has afforded to his military superiors ample opportunities of judging of his fitness or unfitness for command, a quality which no examination, written or otherwise, could in any way practically test. Such is a brief outline of the rules

affecting the appointment and promotion of Officers who have not previously served in Her Majesty's regular forces; they have now been in practice for a good many years, and I venture to think that they offer very substantial guarantees against absolute ignorance and incompetence.

In considering, however, the general efficiency of the whole body of Officers, it must be remembered that the Regulations of which I have given a brief summary represent only the irreducible minimum of military attainment required, and that this is supplemented by a very large amount of "stiffening."

In the first place, we have the very large body of Officers who have already served in Her Majesty's regular forces. The exact number of these I am unable to furnish, as on this subject the Army List is not a complete and accurate guide, and that the information required could only be obtained by calling for Returns from each corps. I think, however, I am more likely to be under than over the mark, if I put them down at not less than 400, and one of the military papers is responsible for the statement, that of these upwards of 150 have war service. Next to these come the Officers who have served during long periods of embodiment: this class had lately dwindled to a very few who served, some of them for four or five years permanent duty during the Crimean War and the Indian Mutiny. In 1885, however, these were reinforced by the Officers of the eight corps embodied in the spring of that year, and disembodied in November after seven months of permanent duty. It would probably be not far from the truth to put this class at not less than 150.

Farther, we must reckon on those who have voluntarily passed through the schools of instruction: these numbered on the first day of last month upwards of 600.

Then we have a class of Officers who have been attached for duty, ordinarily for not less than six months, frequently for far longer periods, to the depôts of their regiments. As the number of these at one time, 1886, amounted to 100, and in the early spring of this year they still numbered between fifty and sixty, these might perhaps be estimated at 200.

Next we may take those Officers who have gone through the Hythe course: these amounted last month to 268. Again there is a class, a very small one, not yet amounting to quite 100, who have passed the voluntary examination in tactics.

There is a further body, whose numbers there are no means of estimating, namely, those who, instead of attending a school of instruction, have elected to be attached for a period of one or two months to regiments of the line, or to brigades of the Royal Artillery, or to their own depôts. These figures are exclusive of the Adjutants, whose value in strengthening the military tone of their corps is universally recognized. Taking these figures as a very rough, but, I am confident, not an exaggerated estimate, I think it will be safe to conclude that fully one half of the entire body of Officers have in some form or other voluntarily gone far beyond the irreducible

minimum of military qualification required from them by the regulations.

I venture to think that these facts and figures are creditable to Militia Officers as a body, and go far to show that they construe in no niggardly spirit the engagements they have contracted with their country.

I trust that it may not be imagined, from what has gone before, that in my opinion the officering of the Militia admits of no improvement: all I have endeavoured to establish is that it contains great elements of strength and efficiency, and that it is well worthy of the vigilant attention of the authorities, and of well considered improvement and development.

With your permission, I will now try to show on what lines improvement might be based. The system which I have described, by which it is at present sought to secure efficiency after first appointments, and in the case of subsequent promotions, is a good and sufficient one, so far as a system based on examinations may be. But examinations by themselves cannot be safely relied on as tests of efficiency. They have two specially weak points, first, that it is impossible to eliminate from them the element of "cram," that it must always be possible by cram, and the use of cunningly devised text-books, to get together a superficial knowledge which may see a man through an examination, but which passes from his mind like a dream when it has served its turn: and secondly, that examiners, even in spite of themselves, more or less accommodate the strictness or otherwise of the trial to the opportunities of the candidates, and are contented with a low standard of proficiency where the opportunities for a higher one seem more or less out of reach.

Now I maintain that the only sound and real foundation of efficiency must be, not bookwork, but good sound barrack-yard drill, and that the habit and manner of dealing with and commanding soldiers can only be learnt by practical work. And therefore I hold that our system of securing efficiency should be based on the exaction of a fixed and compulsory amount of practical work, and that the examination should be only the test of the thoroughness of that work.

Our present system is not compulsory, but permissive.

A young Officer on first appointment knows that before the end of his second training he must pass a certain examination, and, with a view to his passing it, he is offered several alternative courses, attendance at a school of instruction, being attached to a regiment or a dépôt, attending the preliminary drill of his own corps, &c. But, as far as the Militia Regulations are concerned, it is perfectly optional for him to adopt no one of these various courses, but to trust to what he can pick up in the scramble of the training, supplemented by the diligent use of one or two cram books, for seeing him through the "Exam." But, though he may struggle through it, and get his certificate, his military education has none the less been laid on utterly insufficient foundations. I advocate, therefore (and I know that I do so with the entire approval of many Commanding Officers

who have at heart the well-being of the Militia), that the permissive system above described should be at once abolished, and that for it should be substituted the plain and simple rule, that every young Officer should go through a certain minimum amount of practical drill and instruction, and I don't think anyone will consider it too exacting, to make that minimum equal to the amount to which, under the present regulations, he may voluntarily subject himself, namely, two months, in addition to his training. This would ensure, what the present system does not, that every Officer had received at least a thoroughly substantial grounding in his duties, and I can think of nothing that would do more to promote the solidity and efficiency of the force. I am of course perfectly well aware that in a great many regiments the above conditions are insisted on, and with the greatest advantage; but what I protest against is that in *any* regiment it should be optional for an Officer, to whose charge the lives of British soldiers may be some day entrusted, either thoroughly to master the foundation and elements of his duty, or to scamp and neglect them. I may be told that young men or their parents might object to these conditions as too stringent: my own experience, extending over a good many years, teaches me to make very light of this objection: the loss, if any, would not be of the class of men who would be most missed, and would, I believe, be much more than compensated for, by what the force would gain in the public estimation, from the knowledge that it could no longer be said to include in its ranks those who were Officers only in name.

If it be conceded, as I think it will, that the compulsory should be substituted for the voluntary system at this stage, there arises the further question whether it is desirable to retain the three alternative methods at present recognized for undergoing the authorized course of instruction. It will probably be at once admitted that this instruction, to be most valuable, should precede the young Officer's first training. This at once rules out the schools of instruction, for the purpose of his preliminary drill, as he must produce at the school a certificate from the Commanding Officer and the Adjutant of his corps, that he has already mastered the elementary portion of his work. There remain practically only the two alternatives, 1st, of being attached to a regiment of the line, or, 2nd, to be attached to his regimental dépôt, or to his own corps during the preliminary drill. It seems that to place the two alternatives alongside each other answers the question. Surely, if there be such a thing as *esprit de corps*, and it be thought worth while to foster and encourage it, it is making a false start to allow the young Officer to begin with the impression that the headquarters of his own regiment is not *the* school in which he can best begin his military education. Surely too, there can be no comparison between the amount of care that will be expended on his instruction, and the amount of wholesome supervision that will be exercised over him, by the Adjutant and the Officers of his own regiment, and what can fairly be expected in a strange regiment, where he is only a passing, possibly an unwelcome, visitor, whose efficiency or conduct is a matter of indifference.

If, then, of two alternative ways of doing the same thing, one can be shown to be incomparably the better, it seems a needless complication to retain the other, and therefore it is suggested that, in place of the present alternative system, there should be the plain and simple rule that the young Officer should begin with two months' work at the headquarters of his own regiment, prior to the commencement of his first training.

Thus far the question of the recruit Officer has been dealt with; it is desired now to proceed a step further, and to consider how far it may be possible to build upon the foundation already laid, and to qualify him for promotion to higher grades. He will of course learn much by strict attention to his duty during successive annual trainings; yet I think that the man who aspires to command a company might not unfairly be called upon to do something outside of and beyond his annual regimental duty during the four or five years at least that ought to elapse before his turn for promotion comes. At present the schools of instruction are the principal means of doing so, and I can hardly speak too highly of the admirable results obtained, especially at the Wellington Barracks School, with which I am most familiar. The School at Dublin appears to have altogether lapsed, and the School at Aldershot appears to be somewhat intermittent, and the changes of the Commandant and Adjutant, consequent on the frequent moves of regiments, make the results more precarious.

There are, however, two objections to the school system, as at present existing. 1st. It is laid down by the Militia Regulations that a School Certificate only avails to absolve its possessor from a further examination in the subjects in which his certificate pronounces him qualified, should it be dated within two years of his examination for promotion. The *object* of this regulation has always been to me a mystery, for it is difficult to believe that its framers can have deliberately intended that the instruction given at the schools should be of such a superficial character, that it might be taken for granted that in two short years it should have been obliterated from the young Officer's memory. The *result* of the regulation is, however, only too plain; it acts as a distinct deterrent to attending the school during the first year or two of the subaltern's service, the very time into which it is most desirable that he should concentrate the greatest possible amount of military instruction. Precisely the same rule exists in the case of Field Officers' certificates, with, if possible, more mischievous results; Captains can scarcely hope for promotion to the rank of Major till after eight or ten years' service in their present rank, and this regulation is a direct and strong inducement to them to postpone for years the great advantage which they and their regiments would derive from their attendance at the schools.

The second objection to the existing school system is this: excellent as is the instruction given, it is practically limited to the very subjects for learning which the young Officer has the amplest facilities at his own regimental headquarters, or during his annual training. Company and battalion drill are taught at Wellington



Barracks, with a finish and completeness that leaves nothing to be desired. But the means of teaching these subjects should be ample in every regiment, and, though I take a different view, I can entirely enter into the feelings of Commanding Officers who are content to train their young subalterns entirely at home. That this feeling is not unusual may be gathered from the fact that the number of Officers holding school certificates is almost stationary. But there is one significant fact which calls for notice, namely, that while the number of infantry Officers holding certificates rather tends to fall off, that of artillery Officers shows a marked increase. To what does this point? Surely to the fact that at the artillery schools, unlike the infantry schools, the Officers are enabled to pass through a higher course of instruction than they can command at their brigade headquarters. The remedy is thus clearly indicated: make the school less elementary in its teaching, and let it specially aim at teaching those branches of military work which are not, and in most cases cannot be, taught during the twenty-seven days' training. That time is generally spent, and rightly so, in solid squad, company, and battalion drill, and in musketry instruction, and there is a feeling, carried perhaps sometimes to excess, in favour of thoroughly mastering the first two subjects mentioned, rather than carry battalions forward to the study of work quite equally necessary. In point of fact, partly from want of time, partly also, and very largely, from want of suitable and sufficient ground, such subjects as working in extended order, either in attack formation or in skirmishing, are apt to be treated rather as "extras" than as matters of first necessity, and outpost duty, reconnoissance, the formation of advance and rear-guards under the varying conditions of ground, and field entrenchment and spade drill, are of necessity neglected.

I venture, therefore, to advocate that the schools of instruction should be made less elementary in their character, that Officers joining them should be required to produce certificates, if candidates for Field Officer's rank, of their acquaintance with battalion and brigade drill, if for the junior rank, of their capacity to command a company in battalion, and that, while battalion drill, and specially those simple movements required to move troops into the positions from which they could be extended either for attack or defence, were practised, and the very utmost exactitude and finish enforced in their performance, the greater part of the time should be devoted to such subjects as those enumerated above, and that the schools should become places of instruction in the practical duties of modern soldiering, rather than in the old formal rectangular movements of Parts II and III of the Field Exercises. Such a system would of course be impracticable in the narrow parade-ground of Wellington Barracks; but there seems no reason why the Officers of the Guards who have conducted the school so admirably in London might not achieve equally good results, were the establishment transferred to Aldershot, or to some other spot where a sufficiency of suitable ground was available. To establish it at Aldershot would ensure another and not inconsiderable advantage; at present, after

his two parades at Wellington Barracks, the young Officer has done with soldiering for the day; at Aldershot he would spend every hour in a military atmosphere, and would insensibly absorb more or less military knowledge.

I venture to think that under the conditions suggested, the school would have far greater attractions for Officers who wished to advance themselves in the knowledge of their duties. And I think further that, the means being thus provided, it would be quite fair to call upon subaltern Officers who aspired to promotion to the responsible rank of Captain to show their willingness to qualify themselves by something beyond mere attendance at the annual trainings, and that it would not be an extravagant demand on their zeal to call on them, during their four or five years' service as subalterns, to devote one month to attendance at the school. It is proposed, therefore, that, as a general rule, a school certificate should be required for promotion to the rank of Captain. But I think that the following exceptions might be made with fairness and with general advantage. We all know that musketry is not, to say the least of it, the strong point of the Militia. I have no time here to dwell on the various causes of this shortcoming, but one of them is unquestionably the deficiency of practically instructed Officers. Every possible encouragement should, therefore, be given to Officers to go through the Hythe course, and it would only seem fair to allow the same value for a Hythe, as for a school, certificate. Again, there may be a certain small number of Officers whose time is so occupied that even attendance at the annual training involves a considerable sacrifice, and who could ill spare a second month, even once in four or five years. It is suggested that the voluntary examinations in tactics, as involving nothing beyond a steady course of reading, which could be best carried on at the Officer's own home, would meet these cases, and that a certificate of the junior grade should have the same value as those from the schools or from Hythe. It would thus be assured that every Officer promoted to the command of a company had given some earnest that he recognized the serious responsibility he was willing to undertake.

In dealing with promotion to the rank of Field Officer it is proposed to work on the same lines. During the eight or ten years that a Captain will have to wait for promotion to field rank, it does not seem too exacting to require that he should sacrifice the time necessary for attending the school of instruction, and securing the higher certificate. By the present regulations he is compelled, if he does this, to pay his own expenses. This is a distinct deterrent to an Officer desirous of making himself efficient, and it seems hard that in addition to the sacrifice of time, he should be mulcted in a by no means inconsiderable sum of money, specially in the case of those Officers whose geographical distance from the schools involves heavy travelling expenses. It seems only reasonable that they should be permitted on receiving their certificates the pay and allowances of their rank. Here, again, with a view to offering every encouragement to musketry, and with the special object of securing among the senior Officers a certain leaven of men familiar with our

musketry system, it seems reasonable that a first class extra Hythe certificate should be considered the equivalent to a Field Officer's school certificate. And similarly a certificate of the higher class of the voluntary examination in tactics might be allowed the same value.

I venture to think that the changes advocated contain nothing revolutionary or contrary in principle to the existing system; they are rather a simplification and development of that system, and their adoption would, I believe, be heartily welcomed by those Officers of the force, and they are many, whose hearts are in their work. I have already indicated that something beyond the isolated training of individual battalions is indispensable to improved efficiency. To anything savouring of teaching men to run before they can walk I am utterly opposed; and to incorporate Militia battalions in brigades and Divisions, and employ them in grand manœuvres before they have had a solid course of preparatory drill would be, I think, both useless and mischievous. To assemble Militia battalions every four or five years in brigade, for the last week or ten days of their trainings, would, however, in no way be liable to the same objections, while it would give to both Officers and men an interest in, and an appreciation of their work, which is now necessarily wanting; it would, by encouraging a wholesome rivalry between different corps, immensely increase efficiency, and it would give to the public, and also to those responsible for our military system, opportunities not now existing of judging how far the Militia is effective and reliable.

I shall perhaps be told that to do this would involve outlays for staff, for travelling expenses, and hire of ground, and that even the other reforms advocated would cost something in the additional number of Officers drawing pay for school attendance.

I can only answer, "*Qui veut la fin veut les moyens.*" If it is worth while having a Militia at all it is worth while making it efficient. But if it must be taken for granted that we have reached the maximum amount that the country can, under any circumstances, afford to pay for the force, then I say that all military experience teaches that our object should rather be to have a comparatively thoroughly organized force, with complete and efficient cadres of Officers and non-commissioned officers. With the strong leaven of well-drilled men now filling the ranks of the Militia, it can rapidly assimilate and make efficient large masses of recruits, *if the machinery for doing so be kept in perfect order.* What does take time is the creation of the machinery, namely, the Officers and the permanent staff. The latter is, taking it altogether, in a high state of efficiency, and, therefore, I would gladly see the military authorities concentrate their present attention on the sufficiency and the efficiency of the Officers. I don't for a moment admit that, as a body, they have in any sense fallen short of what could be fairly expected of them. I believe that in zeal and sense of duty they yield to none in Her Majesty's Service, and, so believing, I should rejoice to see steps taken to add to their numbers, and increase their usefulness.

But whether these hopes may be fulfilled or not, let my brother

Militia Officers remember that the future of the force is mainly in their own hands. It won't do to sit still and lament that more is not done for "the old constitutional force." In these days we shall be judged with very little reference either to age or constitutionality. Commanding and other senior Officers can do very much by example and the encouragement of zeal and goodwill to raise the military tone of the force, and every one of the excellent class of young Officers now serving who, either by attending a school of instruction, or the School of Musketry at Hythe, or by the study of tactics, or by doing permanent duty at a depôt, or in any other way, endeavours to make himself more capable of commanding men, is doing his part in vindicating the proper position of the force to which we are all proud to belong.

I have been compelled from considerations of time and space to leave untouched many points of interest connected with my subject. I don't expect that my suggestions can command the assent of all. They are put forward in no dogmatic spirit, but rather to elicit the opinions of others, quite as well qualified as myself to judge, and specially with the hope of attracting attention to a very important subject, and to afford to those taking interest in the force that opportunity of exchanging ideas and experiences which is so desirable, and which, from the necessarily isolated character of the Militia, is so rare.

Colonel STRATTON BATES: Sir John Hay, ladies and gentlemen, when I saw it announced that Colonel Walker was to deliver a lecture on the offciring of the militia, I made it a point, at some inconvenience to myself, to attend, being sure that I should hear something worth listening to. Colonel Walker's name is well known as that of a most efficient Officer of militia, and when I was first connected with the militia, the regiment in which I was then Major served in the same brigade as Colonel Walker's regiment at Cannock Chase. I remember how very smart his regiment was, and how well he handled it. I think possibly there may be present some Commanding Officers of militia regiments who may be somewhat disappointed with Colonel Walker's paper, because they may have expected that he would communicate something to them in the way of the great secret, namely, how to obtain a supply of Officers for the militia, for that is a question of great interest to everyone connected with the force, especially to some Commanding Officers who really find it almost impossible to get Officers for their regiments; for myself I have not suffered from that difficulty, having had the good fortune to succeed to the command of a regiment with good traditions, so that I have been able to keep up the supply of Officers, but still I have been asked by other Commanding Officers to tell them the secret of doing so. There is no doubt that the agricultural depression which has existed, and which is likely I fear to increase, will still further impress upon every Commanding Officer in the Kingdom the difficulty of obtaining a supply of Officers. Colonel Walker has said a good deal about inducements to Officers to join the Service; but I think he has omitted to touch on the subject of holding out inducements to a particular body of Officers who already are efficient, and whose services might be made use of, as to which I will say a word or two later on. Colonel Walker recommends that two months should be spent at headquarters. Now, I gather from that remark that in Colonel Walker's regiment the recruits are trained together under the old system, *i.e.* for fifty-six days before the annual training; because at present in most regiments recruits are being trained all the year round. He recommends five years' service before an Officer should be promoted to a company. I should say seven years. I think that is a quite short enough period in which to obtain that "sound barrack-yard drill and sound foundation of efficiency," which Colonel Walker rightly lays down as being so essential.

I think seven years—which after all really only means seven months—is not too long to obtain that. Besides that, there is a certain injustice in the very short service of three years as at present. Take, for instance, two lads joining the Service, the elder one goes into the line, the younger into the militia. Now, when those two men meet afterwards at Aldershot or elsewhere, the one who failed perhaps in his Army examination and remained in the militia commands the other, a man perhaps of 7 or 8 years' service, his own service being only 3 or 4 years. I do not think that is fair, and it makes militia rank looked upon as not a reality, it is not taken *au sérieux*. I am very much of Colonel Walker's opinion as to obtaining certificates from Hythe or the School of Musketry, or an examination in tactics as a necessary qualification for promotion. At present it is difficult to get Officers to go to Hythe, and therefore some strong inducement should be offered. As to tactics, I myself, though rather an old man for that sort of thing, went in for an examination in tactics, hoping to set an example to the others. I was fortunate enough to be the only Officer who obtained special mention in tactics in the first examination, but it has not had the slightest effect, at least as far as my own regiment is concerned. Young Officers say they get nothing by it, and they won't go—moreover, they have to pay their own expenses. There is a body of men whose services are, I think, not sufficiently made use of, to whom the door of entrance into the militia is in some way closed. I mean ex-Officers of the Army. It may be said that I speak from the point of view of an ex-linesman, but though I served more than a dozen years in the infantry and cavalry of the line, I have served still longer in the militia, and therefore think I am tolerably impartial. I believe that in the retired line Officers you have a body of men who have attained efficiency, and who ought to be induced to join the militia; they would leaven that mass of zeal that there exists—zeal without knowledge in some cases, but very true zeal. The linesman would be a useful Officer, more especially in cases of emergency such as embodiment. The militia Officer gets on very well in ordinary trainings, but when there is anything particular to be done the linesman comes to the front. It comes to him as naturally as possible; he has been at it all his life. I think it is a great advantage to have a number of linesmen in the Service. At present there is a great difficulty in bringing in a linesman. As soon as you want to bring in a line Captain the subaltern of three years' service stops the way, and you cannot bring him in. I think it is a pity that these things are not altered so that more ex-Army Captains might join the militia as Captains. Let me give you an instance: an acquaintance of mine, call him Major A., was eighteen years in the Service; he served in three campaigns; he wears four medals; he commanded a body of troops in a very critical operation in warfare, for which he obtained mention in despatches and a brevet Majority. He left the Service, as men do when they marry, and, as men always do, regretted leaving the Service very much afterwards. He was anxious to go to the militia as a Major, and went to the War Office, where he was told, "Find a Colonel of militia who will take you, and we will talk to you." That was the regular answer given. He has, I believe, found a Colonel, but the Colonel could do nothing for him, because this Colonel, though he has a vacancy for a Major, was unable to bring in this experienced and desirable ex-linesman, inasmuch as the senior Captain being "qualified," it was not possible to prevent the promotion going on in the regiment. I won't say it is a scandal to our military system that such a case should occur, but it is very unfortunate in the militia service that a man of that sort, and with such qualifications, should not be able to join the militia. Of course in the militia we want the right sort of men—we do not want the "Queen's bad bargains," but there are plenty of men who are zealous, and who would be of the greatest assistance to a Commanding Officer, and would set an example to their brother Officers. No doubt, in bringing ex-Army Officers into the militia, some self-sacrifice and some abnegation would have to be made by Officers of the militia, but I think it is not impossible to ask them to make that self-sacrifice. On the walls of a cathedral town near which I reside, there is an old inscription which runs, "*Cessat communi proprium*," "Let private interests yield to the public good." I cannot think my brother Officers in the militia would be so forgetful of that motto as not to be willing to make occasionally some small sacrifice when they know that the Service would benefit—that Service to which we are all so proud to belong.

The Earl of GALLOWAY: I wish to say, Sir John Hay, that I really came here on this occasion simply to learn. I understood that my gallant friend Colonel Walker was going to favour the company with a lecture on an all-important subject, and one upon which we know there is no one in this land has a more thorough knowledge. I understood it was hoped that there would be a general discussion afterwards. I felt that as I have taken as prominent a part as anybody during the last fifteen to twenty years in the one House of Parliament or the other in bringing forward military subjects, that I could not do better than come here and listen to all that is proposed without venturing a word myself. But when I find that no one seems ready to rise to make any remarks, I hope I shall be pardoned if I offer a few words on this occasion. I may first say that nothing has given me greater gratification than the fact that Colonel Walker should have brought this subject before this Institution. As I have already said, we know well that this is a special part of our military affairs in this Kingdom which he has made a special study, and I venture to say that although there are very few Commanding Officers, even of line battalions, who have a really greater practical knowledge of military subjects generally, I very much doubt if any of them can compare with him in regard to specific knowledge of the militia. I am sure we must all agree that his paper has been a most comprehensive one. I rather hoped myself that there would have been some reference to the very important subjects to which he has referred, and though the gallant Colonel who has just spoken has dealt with what I certainly consider one of the most important subjects, he still has not made any very direct reference to the whole bearing of the paper, no doubt on account of the very proper ten minutes' rule of this Institution. It will be in the remembrance of Officers commanding militia battalions that within the last few years there has been a general outcry in Parliament as regards the shortcomings of candidates for commissions in the militia, and I think when Lord Hartington was last Secretary of State for War, he sent round a circular to each Commanding Officer of militia requesting them to furnish him with information as far as they could as to what were the reasons for that shortcoming. I may say that I joined the militia originally, I think in the same year as Colonel Walker, in 1854. I was only a few months in it at that time, but after having been near fifteen years in the Army, I in a very few months became Commanding Officer of a militia regiment, a position which I have held for something over fifteen years. That being the case I must say I have been so far fortunate myself, I won't say without difficulty at all, but certainly with the aid of the Lord Lieutenant. Amongst other things, I had been able hitherto to keep up my establishment of Officers to its proper strength. I therefore looked upon this as only a circular, and I did not think it was necessary to reply to it, as I thought I could not give any information on the subject. I am afraid I was guilty of a little bit of breach of discipline and did not think it necessary to give any answer to the circular. However, in a few weeks I got a very summary, and no doubt a very right, reprimand from the General, to know why I had not answered this, and requesting me to answer the question at once. Of course I obeyed. As far as my recollection goes, I answered it somewhat in this way: First of all the great difficulty was having done away with supernumeraries. We used until within the last few years to be always allowed two supernumeraries, and the reason why I think that was very necessary is this. The reason why Commanding Officers cannot at any moment spot a young man and bring him into his regiment is this, viz., that all young men are just about the same age who want to come into a regiment, and if they apply to know whether they can get a commission and they cannot get it at the particular time, they are off, and go elsewhere. They either cut the military altogether, or try some other militia battalion, which is natural enough. Very likely they want to go into a particular regiment, especially on account of the Localization Scheme, and if they cannot get in they say, "I cannot wait, it is no good." Now, if you got that young man, if he were allowed to come in as a supernumerary, it is any odds that within a year or at most two he would be no longer a supernumerary, because probably some Officer above him would get a commission in the line, and so he would come in and be thoroughly satisfied to be in the regiment, and be of use to the regiment, although he had hitherto been only a supernumerary. I made a great point about that, and I drew



it to the attention of the Adjutant-General of the Auxiliary Forces about that time. That was two or three or more years ago, and he, I must say, thoroughly agreed with me, but however nothing has been done. The second point is this: I think I was bold enough to say in very much the same language as Colonel Walker has used that it was not a surprise to me so much that there should be a shortcoming of aspirants as Officers for the militia, but the surprise to myself was that this shortcoming was not very much more extended. This is my reason. Because I saw no incentive whatever to young men to go into the militia, unless they came in simply as an easier mode of getting into the line—that opinion I still adhere to, and I think I need only refer to what Colonel Walker has so admirably stated in detail on that point. What incentive is there? It is an immense expense to any young fellow coming into the militia force, and if he shows that he takes a real interest in his profession by wishing to attach himself to a school of instruction, or getting permission to go to Hythe, or getting himself attached to his dépôt or any regiment of the Guards or line, still for all that he is not encouraged in a proper manner by the State. He has to find his own expenses practically, although in some of these cases allowed a few days' pay. That is what it comes to, and I must say I think Colonel Walker has done us very great benefit in bring this subject forward in this way. I do hope it may reach the attention of those in authority, despite (as he says) the eyes and ears of the Chancellor of the Exchequer, which I expect is our great difficulty. I particularly wish to advert to this point with regard to the difficulty of getting Officers, because I have had the misfortune of having had six vacancies—including transfers upon merit to the Army and resignations—since last spring. Now, if I had been allowed to have two supernumeraries last year, very likely I should have been able to fill those places up. As it is it has come upon me quite suddenly. I must say I have always been an advocate for the militia forming to a certain extent a nursery for the line. I think it is a very good thing for both the Army and the militia, and I rather think the number of young Officers whom it has been my privilege to pass into the Army has been something between thirty and forty. I do not grudge that at all. I think it is to the advantage of Her Majesty's Service generally, and that is what we should look to; but still I think that now that these examinations are competitive, it certainly is hard to individual battalions that all their young Officers can go out, and if they happen to be particularly proficient, can get the benefit of their two or three years in the militia, and then what I may call desert their militia battalion at a moment's notice. I think there should be some limit to that myself, because I do not think it is quite fair to those who have all the responsibility and all the working of the machinery in order to get them fitted for the post to which they naturally aspire, that any number in one battalion should be allowed to go at once. It is very hard indeed upon the Commanding Officers—unless they be permitted to have a supernumerary subaltern or two to fall back upon.<sup>1</sup>

Colonel DANIELL: Having some experience during a service in the militia of thirty-five years, I will ask your indulgence for a minute or two. The very able

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<sup>1</sup> Had time admitted (the salutary ten minutes rule preventing it) I would have suggested the following points:—1. That any one joining the militia should not be taken from the militia to receive a commission in the regular forces until he has served 3 trainings (except with the consent of his Commanding Officer). 2. That before an Officer in a militia battalion can be available for receiving a commission in the regular forces, he shall have passed school, i.e., been attached for the prescribed term to a school of instruction, and obtained his certificate. 3. That no subaltern in the militia shall be available for a company in the militia until he has served 5 trainings at least—and only then or after that period at the discretion of the Commanding Officer. 4. That no militia subaltern shall in any case be commissioned as a Captain until he has obtained the certificate of having passed school (as above). 5. That every militia battalion should strive to accept the services of any Captain in its line regiment should he retire from the latter—or be directly transferred from the line to the militia battalion. 6. That it be compulsory that an Officer in the militia shall pass school within 4 years of his obtaining his first commission.

paper which Colonel Walker has read to us is divided under two heads: one the question of obtaining Officers of various ranks, and the other the education of those Officers when in those ranks. For myself, I have fortunately experienced no difficulty at all under the first head, inasmuch as we have always been full and to spare. This year, although we have passed all the young Officers who have gone up for the line, I have had to provide for eight or nine who wished to join us this year, by passing them on to other Commanding Officers. The difficulty I think will in future be in the rank of Captain, for several reasons, and I am of opinion that any way in which we can induce Officers who have had some service in the line to join the militia will be attended with the greatest possible advantage to the Service generally. I do not wish to detain you with the subject of the education of Officers. I agree with Colonel Walker, that what has hitherto been permissive might be made compulsory. In my individual case it is (so to speak) compulsory. I require all Officers to be attached to regular regiments, and to obtain their certificates if possible before they go out of training. I know there is a little difference of opinion on this point, but I think by being attached to regular regiments to begin with, they get an insight into the interior economy, which is a great advantage, as well as completeness in drill. I do trust that the authorities will look into this question of officering, and give it their attention, and I feel sure that any Commanding Officer of the militia whose opinion they might wish to avail themselves of, would be only too glad to place his time and experience at their disposal. This is no doubt a matter which must become more difficult year by year. It stands to reason that men retiring from the Service, and who would in former times have joined the militia, may now become interested in their own local corps of Volunteers, a magnificent and useful force. It takes up less of their time to belong to those corps than it would to come to us. I do think that if Colonel Walker were to impress upon the authorities the necessity of taking the matter into consideration, and ask the opinion of Officers like himself of great experience in the militia service, it would go very far to remedy the difficulties we are now discussing.

LORD STORMONT: Having had the honour of commanding a militia battalion for sixteen years, I should like to say a few words upon the subject of the very able and exhaustive lecture which has just been delivered. I think it is agreed on all hands that young Officers should undergo some preparatory instruction previous to their first training. The question is, how should that instruction be conveyed? Colonel Walker has told us that there are two ways, either by joining the depôt or headquarters of the regiment, or by being attached to a line regiment. Of course in former years when the recruits came out together, and there was a regular recruit drill under the Adjutant, there could possibly be no better instruction for a young Officer than to join his own regiment. Now that is all changed, and I do not think he is likely to learn a great deal at the depôt. There is also the question of his being attached to the line regiment. That may be very good or it may be very bad; it depends entirely on the Commanding Officer and the Adjutant, if they take pains to see that he is taught his duties. But there is also another plan, if the authorities could only be induced to adopt it, which is that there might be established at Aldershot what I might call an elementary school, which it should be obligatory for all young Officers to attend a month or six weeks previous to the first training. I have called it elementary because I think they should only learn just the actual routine. They should go into the ranks, learn the duties of a private soldier, and learn to a certain extent the duties of Officers, so as to enable them to be of certain use when they join their regiments. If this were carried out, it would also enable them to pass the requisite examination at the end of their first training, which I think, if it can be done, is most desirable. Colonel Walker mentioned musketry as not being the strong point with the militia, I am afraid we must all agree in that, but what is the reason? It is because their training is too hurried. A militia regiment is called up for twenty-seven days' training, out of which there are three Sundays, the day of assembly, and the day of dismissal, and probably two days of inspection, which only leaves twenty days. Out of that the course of musketry will take at least fourteen days, which is far too hurried. In these fourteen days it is quite impossible to give to every man the instruction requisite, and instead of its being the most essential thing for a soldier to learn, in a great many cases the whole

course is degenerated into a farce. The only remedy for this would be to increase the length of the training: of course the answer to this will be that it is too much expense, but surely if it is worth while to spend the large sum of money which is spent on the militia, it would be worth while to spend a little more in order to increase its efficiency. Colonel Walker also mentioned something about non-commissioned officers, who he said were the backbone of the regiment. I quite agree with him on that point. What I should like to see would be that that backbone should be a little strengthened. At present each militia regiment has only two staff-sergeants per company, which I think is wholly inadequate to the work they have to perform. If we could only get three staff-sergeants per company, it would be a wonderful improvement. Also according to the present regulations we are obliged to take staff-sergeants whenever a vacancy occurs from the battalions to which we are joined. There is now a large body of men, pensioners of the line, first class men, all or a great many of them at least willing to go to the militia, whom we are debarred from taking. I am certain if the authorities would only allow us to take these men, it would very much increase our efficiency. We all know the Commanding Officer of a line battalion won't send us the best men. If a good man applies he will say, "Oh no, you can't go," but if he is a man of fair character who is rather stupid he will say, "Oh yes, you will do for the militia." In that case we do not get the best men. It seems to me the three things which are requisite to increase the efficiency of the militia will be to increase the length of the training, to increase the number of staff-sergeants, and to allow the Commanding Officer to select pensioners to fill up the vacancies in the permanent staff.

Captain ROBERT WILLIAMS, Royal Anglesea Engineer Militia: If I venture to follow the very distinguished Officers who have spoken, it must be understood that it is simply to give my own crude opinions, having served twelve or thirteen years, and most of the time as a subaltern. Every one of us who has tried to get men to join our particular regiments knows that the first answer we get is that it is a great expenditure of time—a great trouble—a great bore—and means a considerable expenditure of money. That is the very first answer you always get from every young fellow, and with this addition, that it is not good enough—it leads to nothing. The great question, therefore, seems to me to be whether we can get the militia to lead to anything more than it does at present. The Government has made it lead to something in the case of subalterns, and I venture to think that although there are a great number of militia regiments which are short of Officers, those regiments would be far more short of subalterns if it were not for this one career which is given to militia Officers if they will join the militia at all; that is, that it affords an opening into the line. But still the militia does not offer an opening to any of the higher commands, and that is a point which is worth considering. Another thing worth noticing is that the Government have actually taken away some of the privileges which attached to service in the militia. Formerly, we all know, if a county gentleman joined the militia he could escape such offices as that of High Sheriff. Now that exemption which a militia Officer used to enjoy has been abolished. You may say that is a comparatively small thing, and yet I have known no less than two instances where excellent Officers were staying on in the militia, and one great reason for staying on was that they did not like the notion of being made fools of by being made High Sheriff. That was one of the little inducements. Then to go on to the question of bringing in Officers from the line; the line Officers who come to the militia as a rule are as good men as you possibly could have. They are exceedingly well received by their brother militia Officers, but there often is some little soreness in bringing these line Officers in over the heads perhaps of really competent subalterns. It has been said that a subaltern Officer should not receive his promotion to the rank of Captain, say under six trainings. That seems reasonable enough; but if a subaltern has served six trainings and is a competent man, I think it would be very unfair to bring in a line Officer over his head; otherwise if there is no militia subaltern available, and with six trainings, then I would say undoubtedly it is an excellent thing to bring in a line Officer over his head. With regard to the education of Officers, there is one thing on which I think that all commanding militia Officers here will agree with me, and that is that when a young fellow joins the militia in the first instance, he is full of zeal

and ready to go through any amount of trouble, or any number of school courses that you choose to impose upon him; he will go to Hythe or any other place if it is not at too great an expense for his own pocket. But after he has been in the militia three or four years, it is far more difficult to get him to face all this sort of thing; and I cannot help thinking that those Officers who recommend that these courses of instruction should be done in the first year of training have a considerable knowledge of human nature, and are likely to get him through them then when they would not do it afterwards. I think if he goes through any course of instruction immediately before or after his first training, it should be allowed to stand to his credit, however long a time he remains in the militia service.

Colonel ROWE LEWIS: While entirely agreeing with Colonel Walker's admirable remarks upon the compulsory education of militia Officers, I think the real practical question we have to entertain is how to catch your hare. You must do this before you can cook him (or educate him). I think myself the remarks of the gallant gentlemen who have just spoken are very true as regards Officers passing through militia regiments into the line. My own experience, which is considerable in that respect, is that several Officers who have come into the brigade under my command for the purpose of passing into the line have failed to do so, have remained in the brigade, and are now among some of the very best Officers I have. I would, therefore, not discourage the entrance into the regiment of Officers who hope to pass into the line. But again, the question arises what greater inducements can be given to militia Officers to engage in the Service as such? At present their social standing is little, or very little increased by the rank they hold. I think with reference to that there should be some authoritative statement as to whether a militia Officer is entitled to call himself in private life by the rank he holds in his regiment. I know several excellent Officers who will not do so, from a feeling of uncertainty; and letters occasionally appear in the military papers calling in question the right. It occurs to me there might be other little inducements which the country might accord to militia Officers; such, for instance, as exemption from serving on juries. An Officer in the line is exempt from jurymen's duties, and I do not see why an Officer who gives almost gratuitously a month of his services every year for his country should not also be entitled to exemption from jury duties. I think before we can satisfactorily fill our militia regiments and brigades with Officers, we must try to discover some greater inducements than at present exist for entering this Service. My own brigade is well supplied with Officers, but I know that a number of my brother Commanding Officers are in great straits. One of the strongest points of this admirable lecture and the discussion following it is, what shall we do to induce gentlemen to join our Service?

Colonel WALKER: Sir John Hay and gentlemen, my only regret in being called upon to reply now is that, so far, there is less to reply to than I had hoped. The discussion has been somewhat briefer than I could wish, but at the same time I beg to thank those gentlemen who have been kind enough to take part in it, and I will touch upon such points as occur to me. My friend Colonel Bates, I think, was under a slight misapprehension with regard to what I said about the period of service of subalterns before attaining the rank of Captain. I did not give any opinion as to what that should be; I only stated that according to the militia regulations a man could not be promoted to the rank of Captain under a period of three years' training. That is the minimum, and I most heartily agree that that is too low, and so I indicated in my lecture. But the difficulty is from the facts which I quoted that there are an immense number of battalions and brigades which have not a single subaltern with even that short amount of service. That opened up of course a still more important question, that of the services of Officers from the regular Army. I did not go very largely into that question, but restricted myself rather to the question of Officers who had not served in the line, but as Colonel Bates has referred to it I may say I agree most heartily with him. I think every encouragement should be given to bring these men in, especially as Captains. But I go even further than Colonel Bates, and I would say that supposing a young Officer belonging to your regimental district goes into the line, stays there as a subaltern three or four years, then leaves the Service and comes home, it would be perfectly fair for a militia Commanding Officer to allow that young Officer's line

service to count as if he had been serving in the militia battalion instead of in the line battalion, and to promote him with the seniority of his service in the line. I think that would be perfectly fair, of course subject to conditions, because every case of this kind must be judged on its own conditions. You cannot lay down a general rule without creating hardships. The Commanding Officer must judge each case by itself. I think that principle would be perfectly fair, and it might be legalized by the War Office. I protest, and I always will protest, against any distinction being drawn between an Officer who has served in the line and an Officer who has not served in the line. We all meet on exactly the same footing, and there should be no artificial distinction drawn between us. I know Commanding Officers will confirm what I say that there has never been a time in which they have commanded their regiments in which some of the best Officers they have had have not been men whose services have been confined to the militia. The Earl of Galloway referred to the War Office refusing to sanction supernumeraries. No doubt it would be a considerable assistance if we were allowed to have a couple of supernumeraries. It is a point I have myself brought before every Inspector-General of the Auxiliary Forces for the last 15 years. Every one of them has entirely agreed in the propriety of it, and every one of them has told me that they were obliged to refuse it because the Financial Department would not have anything to say to it. The case does not admit of being argued. It is permitted in the yeomanry and volunteers. It has been refused to me even under these conditions. I have asked for a young Officer to be appointed to my battalion, he giving an undertaking that he would not draw pay and that he was not going into the regular Army, and yet I was refused. It does not admit of discussion. Then it has been said by Colonel Daniel that a young Officer does not learn much at his own *dépôt* and that he had better go to a line battalion. That raises another question which I am afraid it is not worth our while to discuss, that is, the doing away with the old preliminary drill. That is gone, and we have got to accept it loyally because it is the order, but I believe I express the feeling of every Commanding Officer almost in the militia, in saying I very deeply regret doing away with preliminary drill. It was a most valuable system for the militia recruit, and still more valuable for the militia recruit Officer. As long as the preliminary drill existed, the system for the young Officer was so plain and excellent that it could not be improved upon. The young Officer came to be drilled in the ranks with the recruits of his own regiment; he got to know them by name and character; he was working under his own Adjutant, and gradually as he improved in his knowledge of the work and required more extended practice in drill, the recruits were improving too, so that at the end of the preliminary drill they were doing battalion drill, and he was able to share in it. It was the best school the young Officer could go to. It has been done away with, and we must make the best of it. And as I said I prefer the Officer being drilled in his own *dépôt*, because at any rate he is learning something of the family life of his own regiment; he is working with his own Adjutant; there will generally be a number of recruits of his own battalion there, and for the elementary work, for his squad and company drill and the rifle exercise, and musketry, he does not require a very large body of men to help to put him through his work. So that I deeply deplore doing away with preliminary drill, and still think the man's own regiment is the natural school for him to begin his duty in. Lord Stormont has made a most valuable proposal, that an elementary school should be started at Aldershot. I need not say that there is no one would see the inauguration of such an establishment with greater delight than I should. I cannot imagine anything better, but as I think I said in my lecture we have to deal with things as they are and improve them as much as we can, and I should fear the suggestion would be received very coldly indeed at the Horse Guards. At the same time let us hope something may be done. Lord Stormont referred to musketry. I did not refer to musketry because my lecture was limited rather to the question of Officers. I agree with Lord Stormont to a certain extent, that musketry is a question of time, but I maintain that it is still more a question of space, in fact, I always contend that the possibility of carrying out a musketry course depends less upon time than upon having a good range with a sufficient number of targets. My own belief is, that if you have a good range with a sufficiency of targets, which is a very rare condition, it is quite

possible to put a regiment through the whole course, and to do it with good results. That is my own experience. I dare say it differs from that of other Officers, but I think that from the very first year that we did musketry, as far as I remember, in the militia, in 1860, that is a great many years ago, I have never failed to see my regiment through the whole of the musketry course. Even in the year after the mobilization of the reserve men, when they cut the training down to twenty-one days, I succeeded in squeezing them through, although it was a very tight fit. I therefore maintain that if they would give us ranges they might call upon us reasonably to do what they now call upon us unreasonably to do, put our men through a really practical and serviceable course of instruction. The misery that is inflicted on men with these wretched restricted ranges, miles away from headquarters, having to wait three hours on the ground, sometimes in heavy rain, till their turn comes for firing, many gentlemen here know as well as I do, and how very unpopular it does make musketry. With regard to non-commissioned officers, that I did not refer to, but, of course, the question is quite as important as the one I selected, even more so, if possible, and I agree most thoroughly in Lord Stormont's suggestion that we ought to have three staff-sergeants per company. I don't know anything to give more solidity to the force, but we cannot hope for it. Commanding Officers of militia are perfectly well aware that the great difficulty with men not on the staff is to get them to do their duty especially in quarters. When a man does his duty he does it almost in some cases in terror of his life. Is it worth a man's while to do the very heavy work you call upon him to do for the difference between sergeant's and private's pay, twenty-seven days, and also to expose himself to some considerable personal risk if he does his duty as a non-commissioned officer? I say it is not, and I say it is perfectly wonderful that you get the number of non-commissioned officers you do. We have some excellent men among them, and it is astonishing to me they go in for the business. As I say, the difference between the pay of a private soldier and a non-commissioned officer is utterly insufficient to reward them for the work they do, and they ought to receive a bounty of, at least, an additional 1*l.* or 30*s.* at the end of training. There, of course, comes in the Chancellor of the Exchequer. There is a hope I see of strengthening the non-commissioned officer element; there is a most valuable class of men coming into the militia, men who have served in the line, and having completed their reserve service have passed out of the army reserve, and we find a considerable number of these men are now enlisting in the militia. They make a most valuable class of non-commissioned officer, and should be encouraged in every way. I should offer a double bounty for such men. They enlist probably at seventeen, do their six years in the line and seven years in the reserve, and then by about thirty years old you could not have them at a finer time of life for non-commissioned officers, and those are the men we ought to look to for our non-commissioned ranks. Lord Stormont referred to the difficulty about the sergeants we get for the permanent staff. I entirely agree, but I always go on the rule that we must accept accomplished facts. I have, however, never ceased to regret doing away with the old system of giving us pensioned sergeants. The present system in too many cases resolves itself into a sort of eliminating process in a line regiment. It seems as if the notice was put up about the militia, "Rubbish may be shot here." You must all be aware that that system exists to a considerable extent, but the remedy will be very hard to find. Mr. Williams and Colonel Lewis have both touched upon a very important subject, viz., that there is not an inducement for Officers to serve in the militia, that it opens no career. They also referred to certain immunities which it would be perfectly fair to call for, that Officers serving in the militia should be relieved from serving as jurors or as Sheriffs. So far as juries are concerned that is so in my district. I do not know whether it is legal or not, but they are always excused. I know that I have never been so called upon. It is no part of my business to go into the question of educating young Officers for the Army. I confine myself to the subject of the education of Officers for the militia. But the subject has been touched upon, and therefore it might be discussed. The young gentlemen who join the militia in the hope of entering the line are a very nice class of boys, and, I believe, many regiments would find the greatest possible difficulty in filling up the numbers with-



out them. A certain residue of them fail in their examination, they remain in the regiment, and are very useful. But I confess I stand in amazement at the very bad bargain the authorities at the War Office make with them; they can get any number of them, and, therefore, the Horse Guards might make any conditions they pleased with them, and why they do not lay it down that these young gentlemen should be thoroughly drilled and fit for their duty when they join their line regiments I cannot imagine. They might insist that they should receive at least as much drill as militia recruits. The militia recruit has to get twelve weeks' drill in his first year, and yet they allowed the young Officer to scamp his work and pass by with two trainings. Why they do not lay it down as a rule that these young gentlemen are to go through at the very minimum the same amount that the militia recruit has extracted from him I do not understand. That, however, is their business and not mine. I have not had much experience of that class of young Officers myself, because I prefer teaching young gentlemen for my own regiment and not for other people's. I have only one out of twelve subalterns who has any idea of going into the line, but I have seen a great deal of it in other regiments. A very fine body of young gentlemen they are, and very willing to work. As Mr. Williams remarked, in their first year they are extremely zealous and keen, and that bears out precisely what I said about the absurd rule of the School of Instruction. If a young gentleman goes to the School of Instruction in August, and gets a certificate at the end of three years' time, he has to pass his examination for his company. He goes up with his certificate in his hand: "Here is my certificate, saying that I am thoroughly up in company drill." That certificate is not worth the paper it is written on, because it is dated three years back. It is too illogical to admit of argument. I do not think there is any point I have left untouched. I feel extremely gratified at seeing so large a body of militia Officers around me. I am very grateful to those who have been good enough to come. It shows that in spite of a good deal of discouragement there's a good deal of life in the old force yet, and I do not despair of its asserting itself. A good deal of holiday soldiering goes on in the country, but when it comes to real rough work, I never knew an occasion on which they did not come straight to the militia to get that work done, and I never knew a case in which the militia did not do it, and do it right well.

The CHAIRMAN: I have one duty to perform, and I am sure it is not a formal one. It is to request your thanks to Colonel Walker for the interesting lecture he has given us. I am aware it ought to be the duty of the Chairman perhaps to say something in illustration of the paper, but you will readily understand I am here merely as a casual Chairman. We all regret exceedingly that General Fremantle was prevented at the last moment from coming; but as a Vice-President of this Institution and having the honour to know Colonel Walker very well, I at once availed myself of the privilege he conferred upon me by accepting the vacant chair. I can add nothing, however, to what has been said with reference to the subject before us. I have seen something of the service of militia Officers when they have been embodied. I well remember many years ago, both at Corfu and Gibraltar, the excellent service done by one of the Northamptonshire Regiments, one of the Lancashire Regiments, and the Wiltshire Regiment, after the Crimean War. The Officers and men were all that could be desired after they had been embodied: but before they had been long embodied, I happened to be at Portsmouth as Flag Captain just before I went to the Crimea, and was dining at the table of Sir James Simpson, the Governor, before we both started. He had inspected that morning the Wiltshire Regiment. Lord Methuen, who commanded it, was at the table. They had marched 35 miles, only two men falling out, a march which Sir James Simpson said did them the greatest honour, and Lord Methuen, returning thanks for them, said: "Yes, Sir, and I can assure you there is not a poacher left in the county of Wilts!"

Friday, May 20, 1837.

GENERAL THE RIGHT HON. VISCOUNT WOLSELEY, K.P., G.C.B.,  
G.C.M.G., &c., &c., Adjutant-General to the Forces, in the Chair.

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### TACTICS AS AFFECTED BY FIELD TELEGRAPHY.

By Colonel LONSDALE A. HALE, late R.E.

THE appearance in this theatre of a two-headed and double-voiced lecturer is a phenomenon due to the nature of the subject submitted to your consideration this afternoon.

It is an accepted fact that the successful conduct of the Operations of Strategy is greatly facilitated, and in some cases, only rendered possible by the existence of telegraphic communication between the Supreme Strategical Leader and his subordinates; and some little time ago it occurred independently to some of my brother Officers immediately connected with the Telegraphic work of the Corps, and to myself, that if in the Operations of Tactics the same kind of communication existed, similar advantages would be gained, and the Leading rendered more effective. After, therefore, consulting together, and submitting the matter to our immediate chief, the Inspector-General of Engineers, we came to the conclusion that it was desirable to bring it before the Army generally for their consideration; but in doing so we have to bear in mind the two-sided nature of the question: it is at once Tactical and Technical. Viewed on its Tactical side, it is of importance to, and must interest Combatant Officers of all arms; viewed on its Technical side, it may interest and is important to Engineer Officers only. Moreover the cart must not be put before the horse. It would be mere waste of time and labour for Engineer Officers to prepare for Tactical Operations a particular system of communication, if when it is prepared the Leaders of those Operations regard it as useless, and decline to avail themselves of it. The first step to be taken by us, therefore, is to obtain from the Tactical Leaders an opinion whether Telegraphic Communication will be of service to them in their work in the field. An affirmative answer on this point is essential before the Technical side of the question is approached. Purposely, therefore, are these two sides this afternoon presented to you, separate and distinct from each other; and it was thought that although I am an Engineer Officer, yet inasmuch as my professional work has been mainly in connection with Tactics, my taking the place of leader in the Lecturing Tandem would be an indication, at all events, that it is Tactics, not Technical Work, which is in the forefront this afternoon. And it is because both the Inspector-General of

Engineers and ourselves felt that the question should be placed before the Service as, in the first instance, essentially one for the consideration of the Tactical Leaders, that we asked your lordship, the Adjutant-General, responsible for the Tactical Training of the Army, to honour us by presiding here on this occasion.

And, gentlemen, I would ask you to aid us to keep the two sides of the subject distinct from each other by dismissing from your minds, whilst I am addressing you, even the idea that there is a Technical side to be examined. Think as little about technicalities, ground wires, overhead wires, batteries or insulators as you do when using telegrams in the transactions of everyday life, with this comforting difference, that in the telegraphic communication advocated here to-day, there will be no end to be gained by your rendering your message mysterious and a conundrum in order to save an extra half-penny. Until my wheeler-colleague, Major Beresford, rises, the subject of the practicability of our proposal is not before you; just now it is its desirability alone you have to consider. But, gentlemen, it is necessary for me at the outset to state explicitly, that for the tactical views and opinions which I am about to submit to you, for the tactical reasons put forward by me in favour of the introduction of Telegraphic Communication into the Operations of Tactics, I solely am responsible, and, similarly I am not myself responsible for any particular *modus operandi* advocated by my brother Officers of the corps.

On those who bring forward for acceptance any suggestion which they consider progressive, lies the obligation to show in the first place the object of their proposal, its aim and scope, and then to establish a *primâ facie* case that it really merits this appellation; and in doing this I shall almost concurrently endeavour to disarm the opposition which is invariably offered at every step in the path of progress.

But in stating what is the aim and object in the present instance, it behoves me to weigh my words carefully, for I am treading on very delicate ground. "Telegraphic Communication" in the minds of soldiers, is synonymous with "Interference from without." In any conceivable system of Tactics, Tactical Operations must ever to a greater or less extent depend for their success on the bold assumption of the "initiative;" and it is in the dread that Telegraphic Communication, if introduced into Tactical Operations, will be so employed by the Supreme Commander as to tie the hands of the subordinate leaders, and so fetter their action as to deprive them of the power of taking the initiative, that the opposition to this proposal will find its stronghold. To many, this proposal will seem simply opening the door to the introduction into Tactical Operations of that disastrous historic policy known as "Meddle and Muddle." Moreover, it will be urged, and not merely plausibly, that any Tactical Operation is made up of a number of smaller, almost minute Tactical Operations, and that these can only be controlled and carried out successfully by a Leader present on the spot, untrammelled by interference from a distance.

Now, gentlemen, let me at once say how painfully I am aware of the disadvantage I am under in speaking to my brother Officers on a matter

of purely practical soldiering. It has never been my good fortune to see a shot fired in action, and I know full well how in the profession, therefore, any opinion of mine on subjects of this class will be outweighed by that of any individual who has with him the prestige of having taken part in one single skirmish against even the most irregular of foes. No doubt, on active service a man learns a good deal; but the conclusions he draws from that active service are those which are founded on his own experience only, and that must necessarily be very limited; and in this world of compensations it is so arranged that we mere "tacticians of the study" are able to gather in the experiences gained and recorded not by only one, but by numbers of soldiers, to sift the facts, and to deduce from them general laws of combat, to which our brother Officers' individual experiences may have been merely exceptions; and it is from a close study of these numerous, not the few experiences, that I have formed an opinion on these subjects; I hope, therefore, that it is not presumptuous on my part to express it, nor asking too much from you, even the most experienced soldiers, to give it at all events your patient and courteous consideration.

Now, if there is one thing that that study has impressed on my mind, it is the importance, the immense value of the initiative in all military operations of any kind whatever; and unless troops engaged in a Tactical Operation are interpenetrated down to the youngest drummer boy or bugler with the belief that on his personal exertions, on his personal conduct, irrespective of whether his leader's eye is on him, may depend the fortune of the army to which he belongs, such a force has but a poor chance of winning victories; and how can such a belief find practical expression save in the "initiative"? Generals, Colonels, Majors, Captains, subalterns, non-commissioned officers alike, see, moreover, constantly rising before their eyes in Tactical Operations opportunities for pushing on to success, so that a Tactical Operation is, and must ever be, a scene of constantly undertaken initiatives, initiatives undertaken in ever-increasing rapidity and number as the operation draws to its climax.

These are the motive powers which are at work in all Tactical Operations, and with their legitimate action it is not intended to interfere; but what I must ask you to consider without prejudice and without bias is, whether in any Tactical Operations other than on the smallest scale, these motive powers are, in modern war, judiciously applied. I deliberately affirm they are not. Experienced soldiers tell us the principles on which Tactical Operations ought to be conducted, but when we read how such Operations have actually been conducted we find a marvellous discrepancy, a positive contradiction between the principles and their application. It is hardly too much to say that in a Tactical Operation of any size in modern warfare, every man does what is right in his own eyes, anarchy, disorder, confusion, and chaos reign supreme.

The reason for this state of things is, mainly, that owing to the difficulties of communication between the Supreme Leader and his subordinates, and to the fact that the decisions to be come to in

Tactical Operations do not admit of delay, control of almost any kind, even the mildest, by the Supreme Leader is impracticable; and therefore subordinate leaders must act independently, whether they like it or not. But let me ask you whether such a condition of affairs is satisfactory? Is it fair to the Supreme Leader? Is it conducive to the attainment of the Tactical object sought for? Is it likely to lead to economy in men's blood and lives? I hope to be able to give to these queries, one and all, a direct negative, such as will commend itself to your acceptance; and in doing so I beg to repudiate at the outset any sympathy with the idea so popular among the lower leaders, that if at one of the two ends of a chain of military control there is a fool, it is necessarily at the end where the Commander is. I venture to think the converse is as often the case.

Now, gentlemen, there is no conceivable reason why, if we assume the Supreme Commander of any Tactical Operation to be possessed of as much common sense as the leaders under him, he should be, as he is at present, a nominal Commander only. With him, on his shoulders, lies the responsible task of conceiving and drawing up the plan of operations. Why may he not control generally the conduct of these operations? Why may he not determine what modifications shall take place in it during its execution? Yet to-day, as all history tells us, he has the immense privilege of arranging how a particular object is to be effected, and of communicating his so-called orders to his subordinates; that done his power is at an end. At the mercy of these subordinates he lies; although to him the result may be professional degradation or professional advancement, for these he must depend on the views, more or less peculiar, of that much abused "initiative" held by those under him. The operation may be begun against his orders, and carried on contrary to his orders; but he has no remedy; he is helpless.

One of the most generally acknowledged weak points of modern warfare is the rapidity with which troops pass out of the control of their commander. There seems to be an idea that Tactical Operations must necessarily be conducted on an entirely different principle from that which governs all other military operations, and must be a sort of Donnybrook Fair from commencement to finish. But surely there is a judicious mean between close centralization on the one hand, and unbridled licence on the other. In a Tactical Operation of any size it would be an arrant absurdity for a Supreme Commander to interfere by telegram with the details of the attack to be carried out by an infantry battalion, or with the number of rounds to be fired by a battery of artillery, but as the records of battles tell us, it is frequently only that Commander who can rightly determine whether that infantry attack shall be made at all; whether by the discharge of one single shot the presence of guns at some particular spot shall be made known to the enemy.

Let me ask you whether, if any one of you here were in command of some Tactical Operation carefully prepared by yourself, you would not indignantly resent that operation being unnecessarily and prematurely initiated by one of your lower leaders without your con-

currence, if such concurrence were attainable. For such an initiative no excuse would be possible if Telegraphic Communication existed.

As an illustration of my meaning, let me remind you of the conduct of General von Manstein, commanding the German IXth Army Corps on the day of Gravelotte. It is close on noon, not a shot has yet been fired, and this General is marching his corps directly on a point which he has been told to attack if on it rests the right of the French. This is the condition expressly laid down for his initiative. Arriving opposite to it and within long artillery range of it, he sees in front of him a hostile camp, apparently in a state of heedless unconcern. He already knows that so far from the hostile right being in front of him, it is far away to his left; yet in spite of the direct orders he has received, he throws control to the winds. In his limited sphere of observation he considers a great advantage would be gained by surprising the camp; and he orders his advanced guard battery to open fire, and with what result? The premature commencement of one of the greatest battles of the world, and the complete frustration of the Tactical Operation designed by von Moltke himself.

Had Telegraphic Communication existed between the IXth Corps and the Royal headquarters, General von Manstein could in a few seconds have depicted the situation to von Moltke, and the Supreme Tactical Leader himself would have decided whether the effect of the surprise would be worth the upset of a scheme already in progress, and the loss of life consequent on the change. Can anyone say that von Manstein's hands would have been unduly tied, his action unduly fettered, by von Moltke retaining in his own power the control of such an initiative as this?

But it is not only to control the initiative that we would aid the Supreme Commander; it is also to enable him, in the event of his original plan needing modification in the course of the operation, or even being completely checked, to determine a new, a fresh departure; for it is he alone who can view the various and distinct episodes of the operation, each in its right proportion, and can estimate its bearing on the others. It is he alone who can devise the fittest remedy for failure or mistake.

Surely no subordinate leader can do this. At present these leaders, left isolated to themselves, very properly employ their utmost powers for results, which after all may be but local in their effects, and which are perhaps wasted as affecting the general course of the operations, if not detrimental to them. The commanders of three if not four corps at Gravelotte are responsible for having taken independently during the operation a wrongly conceived initiative, contrary to the plan of the Supreme Commander, and leading to a frightful expenditure of human life. If Telegraphic Communication exists in Tactical Operations, it is the abuse, not the use of the initiative that will be restrained, and the efforts of the lower commanders will be directed to the common not merely to the individual good. In a Tactical Operation the Commander should be Commander, whether he be a von Moltke on a field of battle, where the combatants are numbered



by hundreds of thousands, or humble 2nd Lieutenant Tom Smith, in command of an infantry piquet.

At the outset of any Tactical Operation the initiative should never be taken except with the sanction of the Supreme Leader if that leader is at hand. The smallest units launched into the fight at the commencement of the action are the first to escape from his control, but over the larger bodies of which they form part, control must be retained to meet the modifications called for in the course of the struggle; by degrees even these are involved independent of the Supreme Commander, but if the annihilation of command be deferred to the last moment, that General will win the day who, being the best tactician, has been in a position to dispose of his troops according to his preconceived plan, a plan drawn up in conformity to the principles of sound tactics.

But that he may be able to arrive at a correct decision under the circumstances, it is absolutely necessary that when called on to form it he should not be in the Cimmerian darkness in which he is to-day, but that he should be in such a position as to have before his mind's eye at that moment, a picture of the progress of the whole of the operations over all the battle-field. And in this position, Telegraphic Communication will place him.

Had Bazaine on the 14th of August, 1870, when commanding the Rear Guard corps of the French Army, been in telegraphic communication with his flanks, and with the main body whose retreat he was covering, his mind would have been relieved of the two great anxieties which weigh on a rear guard commander. He would have seen before him the disposition of that portion of the army yet on the right bank of the Moselle; and as he would have been able to control both Generals Bourbaki and L'Admirault, on his right and left rear, it is not making a very bold forecast to say that had the Battle of Vionville been subsequently fought, it would have been conducted in a very different fashion.

Let us take now the position of the commander of an infantry division, or an army corps, or of a long convoy advancing on a single road. The presence of the enemy in front is announced by the cavalry scouts; at the present time the Commander is in the hands of the leader of the advanced guard; and even if this Officer condescends not to adopt the initiative, but to refer to his superior for orders, not only will valuable time be lost, but this Leader has not at hand materials on which to form a correct decision. Where the rear of the column is he is not sure; the nature of the ground in front, the exact position of the enemy; all these details come to him by dribblets, after more or less delay, imperfect, deficient perhaps in what he wants specially to know. But the telegraph places him everywhere on his line of march.

To the Cavalry acting as a Screen, the Field Telegraph working probably in connection with the fixed telegraph, usually found existing on the main lines of road along which the Scouting or Supporting bodies advance, will be an important aid in relieving it to a great extent of the difficulties of transmitting intelligence by

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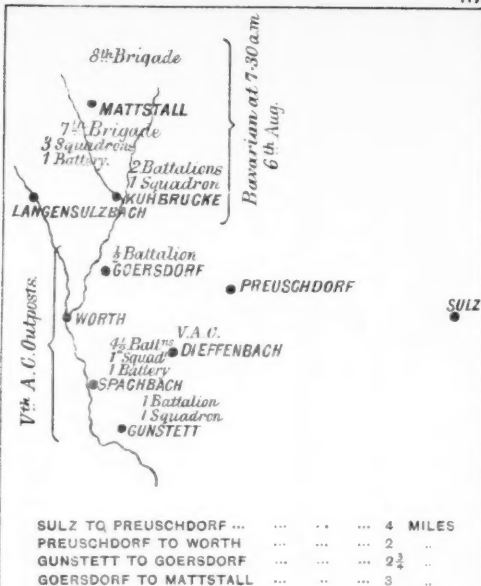
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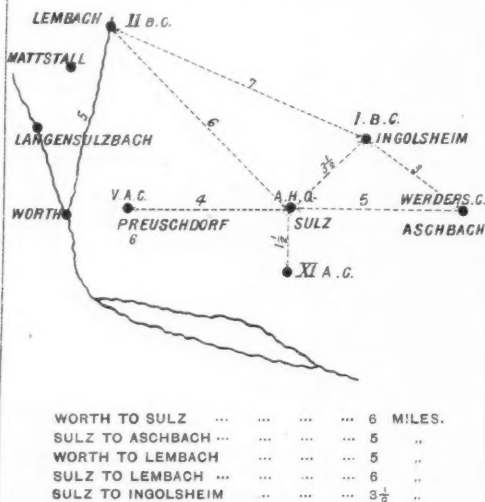
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THE DOTTED LINES SHOW THE TELEGRAPHIC COMMUNICATION ESTABLISHED DURING THE BATTLE OF WATERLOO BETWEEN THE RIGHT CENTRE AND THE RIGHT WING OF FREDERICK CHARLES'S ARMY.



DISPOSITION OF 3RD GERMAN ARMY, NIGHT  
OF 5TH AUGUST, 1870.



INTENDED DISPOSITION OF 3RD G  
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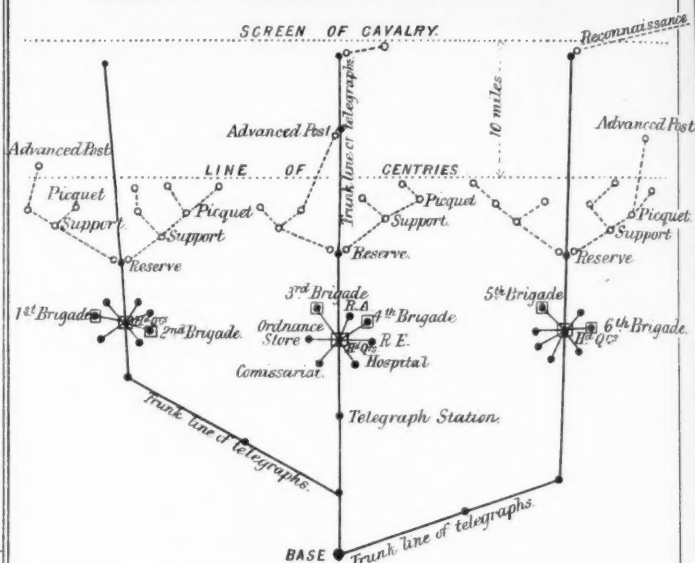
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N OF 3RD GERMAN  
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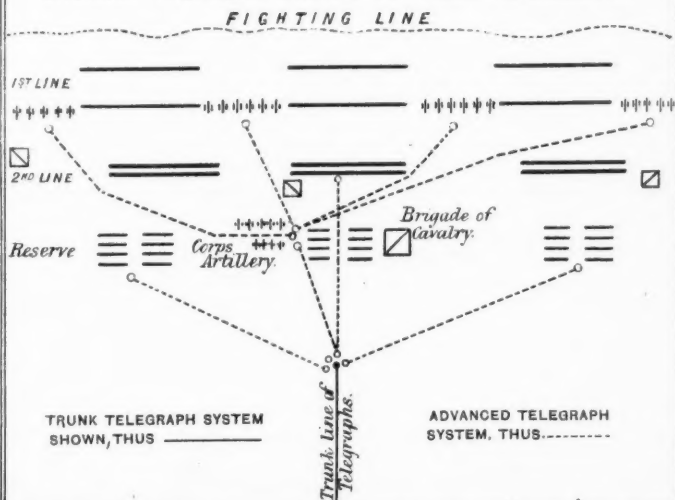
### SKETCH DIAGRAM TO ILLUSTRATE PROPOSED SYSTEM OF TELEGRAPH LINES IN THE FIELD.



TRUNK TELEGRAPH SYSTEM SHOWN THUS ———

ADVANCED OR OUTPOST TELEGRAPH SYSTEM, THUS - - - - -

### SKETCH DIAGRAM OF ARMY CORPS IN POSITION SHOWING PROPOSED SYSTEM OF FIELD TELEGRAPHS.



TRUNK TELEGRAPH SYSTEM  
SHOWN, THUS ———

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relay posts. The rate of progress of the field telegraph cable line may be taken at 3 miles per hour; and though the telegraph wagon may not be able to actually accompany the Scouting or Supporting Squadrons, owing to these starting at a most rapid rate, yet by night we shall find that the old story of the "Hare and the Tortoise" has been repeated, and in the evening, the frequent reports transmitted to the rear partially by wire during the day, will be supplemented by a full and well considered *résumé* of the situation. Will not Cavalry Officers gladly welcome from us an aid which enables them to retain for gathering information their best mounted men, instead of employing them as they may have to do now as mere postmen? And if even though to a less degree, telegraph communication can be established also in the dark, there is no branch of military operations which will be more materially aided by it than those carried on at night.

And now leaving you to consider for yourselves the possible application of telegraphic communication to the numerous Tactical Operations to which the limits of time prevent my even referring, I purpose taking the events which actually occurred on the 6th of August, 1870, in the Sauerbach Valley, and showing in detail how the existence of this telegraphic communication in the IIIrd German Army on that day, might, and probably would, have affected those gigantic Tactical Operations; and it will be for you to say whether under the circumstances of that particular case, concentration of control in the hands of the Supreme Tactical Commander, and his omniscience and omnipresence, would have been a progressive or a retrograde step in warfare.

But before doing so, let me remind those who may have not perhaps given much thought to telegraphic communication, that if such communication be required between two points A and B, say a mile apart, it does not necessarily run by the shortest line direct from one to the other, but starting from A may go even to the antipodes, and thence back to B. A very striking instance of this occurred during the Battle of Le Mans in January, 1871, and my authority for it is the late Lieutenant-General v. Wright, whose memory is dear to all of us his countrymen who had the great pleasure of knowing him personally; he was one of the most distinguished cavalry Officers in the German Service, and in the Le Mans campaign was the Quartermaster-General of Prince Frederick Charles's Army.

At one period of the battle the right centre of the German Army found its communication with the right, some 8 or 9 miles distant, cut off by the enemy. At the little farm St. Hubert a telegraph station was set up and placed in connection with Vendôme, some 37 miles, thence the line was cleared to Blois 19 miles, from Blois to Orleans 34 miles, from Orleans to Versailles 67 miles, and thence by Chartres to the right wing some 100 miles.

Thus through a telegraphic line at least 357 miles long, Prince Frederick Charles was to all intents and purposes present at a point on the battle-field otherwise unattainable. Do you, my most determined upholders of the independence of subordinate leaders, grudge the Supreme Tactical Leader, the Red Prince, this advantage?



In using the Battle of Wörth as an illustration, the following points will be touched upon:—

The disposition of the German Army on the night of the 5th August.

The intended disposition for the 6th August.

The necessity of centralized control during the 6th.

The disposition of the outposts of the Vth Army Corps.

The conduct of the commander of the outposts.

The effect of that conduct on the neighbouring corps.

The conduct of the chief of the General Staff, Vth Army Corps.

The faulty Leading owing to the absence of good communications.

On the 5th August, the day after the victory at Weisseburg, the IIIrd German Army, under the Crown Prince of Prussia, advanced in a southerly direction, drawing in the left wing, and on the right wing pushing out the IInd Bavarian Corps to Lembach to watch the Bitsch road, and the Vth German Army Corps to Preuschkorf, whence it would act as the advanced guard of the army in the event of a subsequent movement to the west. The XIth Corps went about a mile south of Sulz, Werder's Corps to Aschbach, the Ist Bavarian Corps, which acted as the reserve of the army, to Ingolsheim, and the Army Headquarters to Sulz. During the day, information was obtained which showed that on the opposite bank of the Little Sauerbach was a large French force. For the 6th, therefore, orders were issued for a concentration and wheel to the right, and the second diagram shows the position which, according to the intention of the Army Commander, the army was to occupy. The IInd Bavarian and Vth German Army Corps were to remain in the present positions, and the Army Headquarters at Sulz; the XIth Corps to wheel to its right to Hölshloch, Werder's Corps to move to Reimerswiller, the Ist Bavarians to the neighbourhood of Lobsann and Lampertsloch. Furthermore, the Prince intended there should be no fighting, but that, except in carrying out the movements prescribed, the 6th should be a day of rest. This intention was certainly known by the Commander of the Vth Corps. Do Royal Princes ever laugh in their sleeves? If so, the Crown Prince must assuredly have done so when issuing these orders; he probably paraphrased to himself the old proverb: "*L'homme propose, mais Dieu dispose*," "The Supreme Leader proposes, but in my army it is the Lower Leaders who dispose."

The Operation intended for the 6th August was not Strategical but Tactical, a Tactical Operation of the most difficult, delicate, and dangerous kind, for it was a movement of an army, one corps of which was in actual contact with the enemy; it was one, therefore, in which it was absolutely necessary for its successful execution, that every Officer and soldier in the army should forget his individuality, and that the Leader of the Army should reign supreme.

I will now direct your attention to the position of the Vth Corps on the night of the 5-6th August. To the south and west of Preuschkorf, only 4 miles from the Army Headquarters, was the main body of the Corps. The outposts of the Corps were the 20th Brigade, strengthened by a battery of artillery and two squadrons. The reserve

of the outposts, 4½ battalions, the battery, and a squadron, were west of Dieffenbach, only a mile from the main body. At Gorsdorf was half a battalion, thence the outpost line ran through Spachbach to Gunstett, where were a battalion and a squadron. The Sauerbach formed the advanced line, and this is only a mile from Dieffenbach. During the night there were conflicts between the hostile patrols, and at four in the morning, the Commander of the Outposts, General v. Walther, made a personal reconnaissance, the result of which was that, from the noise he heard, he came to the conclusion that it was possible that the French were in retreat. To General v. Walther it appeared to be a matter of great importance to ascertain whether this was the case; and, therefore, he ordered for this purpose a "reconnaissance in force" beyond Wörth, which village lay on the enemy's side of the stream, to be carried out by an infantry battalion and the battery. I am not going to criticize General v. Walther's conduct on taking the step of reconnoitring in force. I am speaking to a professional audience who know perfectly well that a fair criticism on the conduct of a Commander, unless the critic has before him the Commander's own explanation and reasons, is absolutely worthless; and, as I have not these before me, I will not insult your intelligence by inflicting on you a worthless criticism; I am here, moreover, not to criticize but to narrate; but it is perfectly open to me to say that General v. Walther's conduct was one of the most remarkable assumptions of the initiative on record. It might be fair to assume that the General knew the wish of the Crown Prince that there should be no fighting on this day; but even if he did not, he adopted a line of conduct which the merest tyro in Tactics would point to as highly conducive to a battle breaking forth. Two armies in contact, and an artillery and infantry engagement entered on at the outposts. To General v. Walther it may have occurred also that so important was the information to be gained that he could not spare the time necessary for first referring either to his Divisional or his Corps Commander, although these Officers were only a mile from him, still less to the Supreme Leader 5 miles distant, and therefore he felt bound to assume himself the responsibility of the initiative. Gentlemen, had a telegraph wire run from Dieffenbach to Preuschkdorff and Sulz, hardly five minutes would have been required to convey to the Supreme Leader the actual situation, and to obtain from him, the only Officer in a position to give a decision, orders whether or not the reconnaissance in force should be made. To return to the outposts themselves. At 7 A.M. the Battery opens, and for more than an hour a miniature battle with all its noise and turmoil rages near Wörth. The French bring forward Guns and Infantry, the German soldiers get to the further outskirts of the village, but the combatants keep at arm's length; and towards 8.30 General v. Walther withdraws his troops, doubtless well satisfied with the result; he has obtained certain valuable information, and achieved a local success, but whether this success was to the general advantage or detrimental to it the sequel will show; but, as he retires, the sound of guns and musketry to the north breaks on his ear. Why this should be he does not know; but

he is aware that the Bavarian II<sup>nd</sup> Corps is in that direction, and it probably is that they are attacking the left flank of the French. He therefore dispatches to them information of what has taken place. Whether the message reached them we do not know. Even if it did, it must have arrived too late to be of use, but, and here is a point I wish to impress on you, if a telegraphic line had run from Dieffenbach to Sulz and thence to Mattstall, General v. Hartmann, commanding the Bavarians, would have known what was really taking place at Wörth, and would not have engaged at all. And now, before proceeding further, I must touch on two matters. The first is a statement of opinion in a speech delivered here last year by Major-General Webber, an Officer with considerable experience of active service, and possessing a thorough knowledge of Telegraphy. "With regard to outpost telegraphs, which Major Beresford strongly advocates, I am rather sceptical. Years ago, I had the opportunity, knowing the Director-General of Telegraphs of the German Army, of discussing this subject with him—and I must say I could not help agreeing with him in every word—he then said that the attempt to use the telegraph under the ordinary conditions of outpost duty was really out of the question. In this theatre myself, I have more than once said that a telegraph which is not served and maintained in the most perfect way is worse than no telegraph at all. Within the distance of outposts from the headquarters of an army, I believe that all who have ever been in command or have read an account of what precedes actions, either in the night or in the day, must know that there are indications in the air, that there is the sound of outpost firing, the sound of artillery, which tells every General and Officer in the army almost instinctively what is going on." The narrative I shall put before you will, I think, show, on the contrary, that outpost telegraphy is practicable and not out of the question, that the spirit of divination supposed by General Webber to exist at the outposts is sometimes a lying spirit, and that the best means of counteracting its influence is a telegraphic wire. The other point I wish to bring to your notice is that I do not pretend in my account of these events to be absolutely accurate. I always scrutinize closely any statements made by others with regard to the Franco-German War, and I hope that the statements I make will receive from them similar scrutiny. Up to the time that I began to prepare this Lecture I thought I understood the Battle of Wörth; I had been often on the ground itself, had lectured on it, kriegspieled it, and knew the movements pretty well by heart, but when closely studying the other day some details connected with the issue and receipt of orders given by the higher commanders, I found that the Official Account seemed on this point to be self-contradictory. In my difficulty I first applied to a distinguished Officer present here to-day, one of whose greatest pleasures in life seems to be giving himself infinite trouble in replying to queries about the campaign which he witnessed from commencement to finish, Sir Beauchamp Walker. But unfortunately Sir Beauchamp was not actually present at the spot whence the particular order was issued. He supplied me, however, with some valuable MS. Notes of a German

Staff Officer, Major v. Hahnke, but this turned out to be but my entrance into a dense literary fog. For after consulting and comparing the notes, Major Hahnke's own published account of the operations of the IIIrd Army, von Heydenkamp's operations of the Vth Corps, and a most valuable letter from another source, the mystery surrounding the subject is greater than ever; the study has deepened my scepticism of history, and whilst endeavouring to be as generally truthful in my statements as possible, I can only say that no one here present can have less faith in them than I have myself.

We must now return to the battle-field: at 8.30 A.M., as General v. Walther's force is coming back to its bivouacs, there appears on the scene a very important personage, the Chief of the General Staff of the Vth Corps, Colonel v. d'Esch, an Officer who is since dead. The Colonel takes up his position on the slope of the hill west of Dieffenbach, and endeavours by the aid of the spirit of divination General Webber supposes to be present, to realize the situation. Let us put ourselves in his place, and endeavour to picture to ourselves what he sees and hears, but in doing so we must bear in mind that he is standing on the slope of a deep, winding, thickly wooded valley, where clear vision to a great distance is not possible, and along which the echoes reverberate. To the south, at Gunstatt, about a mile away, are artillery and infantry coming into action on both sides of the valley, therefore an action is developing on that wing; over the hills to the north the firing heard by General v. Walther is increasing in intensity; this is a serious matter. No time can be lost, it is possible that the French may be turning on one wing of the army. The Vth Corps to the rescue is the only course to be taken. True, the Supreme Leader wishes to avoid any fighting, but he is too far off to be consulted. It is just the situation where the responsibility for the assumption of the initiative must be accepted; the battery is ordered to reopen fire, the next higher Leaders concur in Colonel v. d'Esch view, the Vth Corps is ordered into action, and the Battle of Wörth begins against the direct wish of the Supreme Leader. Now, gentlemen, I will put before you the real state of affairs as it was at 8.30 A.M., and show you how utterly it differed from the imaginative picture portrayed by this spirit of divination, asking you to remember that the only means by which those Officers on the Dieffenbach hill slopes could have ascertained it, was through the slow and antiquated method of communication, man and horse. At Gunstatt the XIth Corps in their march to the Sauerbach was quietly débouching from the woods on to a position which so far as I remember it is easily defensible, and on it no attack of any importance was in progress. General v. Bose, Commanding the Corps, had no intention of taking any offensive measures himself. No anxiety need therefore arise from this quarter, and any immediate co-operation on the part of the Vth Corps was not only unnecessary but absolutely undesirable, as likely to lead to consequences detrimental to the Supreme Leader's plan of operations, conceived and prepared by himself and his Chief of the Staff, General v. Blumenthal. But how about the north towards Lembach? What was really taking place

there? At some time or other, the exact time is one of the points on which the strangest contradictions of my authorities exists, General v. Hartmann, Commanding the II<sup>nd</sup> Bavarian Corps at Lembach, had received orders for the Supreme Leader, that he was to direct his attention not only to the Bitsch road, but also to the neighbourhood of Langensulzbach; and should the report of cannon be heard on the morning of the 6th in the direction of Wörth, a Division of the Corps was to advance against the enemy's left flank. It is one of the most remarkable things in connection with this matter that this order for the possible action of the Bavarian Corps was not, it is said, communicated to the other Corps. Had General v. Walther known of it, he would have thought more than once before by his "reconnaissance in force," he sent the reports of cannon rolling up the valley and falling on General v. Hartmann's ears. At 8.15 the advanced guard of the Bavarians moved off, apparently from Langensulzbach, but at 8.30 can have been only very slightly engaged in action, if at all, and could have been easily withdrawn. Now, gentlemen, I will ask you to consider what would have been the result of the existence of the very simplest system of telegraphic communication on this ground; a line from Gunstatt to Sulz, a line from Dieffenbach through Preuschdorf to Sulz, a line from Mattstall to Sulz. The result of the existence of this system of communication, which I venture to say is not an unpractical unrealizable piece of theory, but a simple easy piece of practical work, would have been 1st, the formation in the minds of the commanders of a picture of the real situation; 2nd, the avoidance of wrongly conceived and improperly taken initiatives; 3rd, the retention of the control in the hands of the Supreme Tactical Leader. And now let us see what has been taking place at Sulz where that Leader is. Hearing the sound of artillery at Wörth, the Leader has sent Major v. Hahnke to that point. At 9 o'clock that Officer reports something or other at Sulz; what it was exactly, it is impossible to tell as the Official Account contradicts itself,<sup>1</sup> but at all events it led to the dispatch of certain orders to the front, and of these orders one was to General v. Kirchbach,<sup>2</sup> to break off the fight. There is no doubt that this order was received by the General, but so slow must it have been transmitted, that although from Sulz to Dieffenbach is only 5 miles, and the order for the infantry advance was not given until after 10 A.M. (according to the Official Account), it reached the General when in his opinion the Bavarians and the XI<sup>th</sup> Corps were too deeply involved in the battle to allow him to break off the action.

That the Bavarians were hotly engaged was no doubt the case, but it is in the highest degree doubtful that the XI<sup>th</sup> Corps even then were in need of any help. General v. Kirchbach had prior to his first infantry advance sent to General v. Bose a request for co-

<sup>1</sup> Compare the last two lines of the note, p. 155, sec. 3, Clarke's translation, with p. 163.

<sup>2</sup> Since delivering the lecture I have had the pleasure of receiving a most courteous and valuable communication from General v. Kirchbach, in reply to a letter I wrote to him on the subject, but the "order" problem remains unsolved.

operation, and had been informed in reply that the XIth Corps was to advance to the Sauerbach only; it was not until after the failure of the first attack that in reply to a second appeal, General v. Bose undertook to co-operate. What a loss of time and of men's blood and lives was due to the dependence on man and horse solely as a means of securing co-operation. But to the north confusion in orders has become worse confounded. At half-past ten o'clock, at the very moment when the Vth Corps are entering on an operation in which they will sorely need assistance on their flanks, and when the Bavarians are lying pretty well exhausted at the foot of the position against which they have advanced under an erroneous notion of what has been taking place at Wörth, comes a Prussian Officer to General v. Hartmann with verbal orders based on written ones to break off the fight. Who the Officer was, and whence the orders he carried emanated, I cannot ascertain, but the result was that the Bavarians slowly and with difficulty withdrew; but before the retirement was fully completed a message was received at a quarter-past eleven from General v. Kirchbach, to the effect that their co-operation was expected, and the ground given up had to be retaken. Gentlemen, I appeal to you whether the example I have given you does not show clearly and decisively how the existence of telegraphic communication between the Supreme Tactical Leader and his subordinates, and between those subordinates themselves, would not have most beneficially affected, at all events, this one important Tactical Operation; and if this one why not others in future? I do not purpose carrying on my narrative of this operation further, but will only remark that when the Crown Prince arrived on the field, and took command at 1 p.m., he would probably not have issued the orders he then dispatched, had he had in his mind's eye the actual condition of affairs such as telegraphic communication might have given him. Even the most experienced soldier must on arriving at the scene of a conflict already in progress, have the greatest difficulty in forming a correct idea of what is taking place before him, and this difficulty we may hope greatly to lessen by the judicious employment of the telegraph.

I will not interpose any longer between you and my colleague, Major Beresford, further than to say that on Saturday last, through the courtesy of Colonel Harrison, the Commanding Royal Engineer at Aldershot, and of Lieutenant-Colonel Jelf, commanding the Telegraph Troop, that troop was placed at my disposal to carry out a practical exercise in telegraphy at outposts. The exercise was arranged by myself, and was conducted on the Austrian sealed envelope system,<sup>1</sup> rendering the presence and assistance of an actual outpost force unnecessary. Telegraphic lines were laid from Army Headquarters at Farnboro' Station, to the Reserve of the outposts at Frimley, and thence to the supports of the outpost line on Chobham Ridges. At the suggestion of Colonel Jelf, I placed myself at the Reserve, as the Officer Commanding the Outposts; many of the

<sup>1</sup> An example of this will be found in a paper by the late Lieut.-Colonel Carmichael in No. 106 of the Journal.



incidents of outposts, such as an attack on them, movement of the reserve, dispatch of cavalry reconnoissance on the flanks, &c., formed part of the exercise; and I can only say that the feeling of security and control which the telegraphic communication inspired me with, makes me certain that had any Officer, however experienced in actual war, been by my side, he would have at once become a believer in the value of the introduction of Telegraphic Communication into Operations of Tactics.

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### TACTICS AS AFFECTED BY FIELD TELEGRAPHY.

By Major C. F. BERESFORD, R.E.

HALF a century has passed away since the summer night of 1837, when Cooke and Wheatstone (names well known in the scientific world) watched with beating hearts at either end of the telegraph line, just laid from Euston Square to Camden Town, for the first message that ever flashed along a wire.

Those who witnessed the modest success of the fathers of the electric telegraph, scarcely foresaw the great future in store for the new-born messenger, and that, in this the year of its jubilee, its extension to the furthest outposts of an army in the field would be a matter for discussion.

The third of a century has just gone by, since, in March, 1855, the first field telegraph in war was laid in the Crimea, and as to the British Army belongs the honour, so let us trust that the British Army will show the way in the future development of the speediest and safest of messengers.

On every side to which we turn in civil life, the telegraph is making giant strides; nothing seems impossible to it, and there is no limit to the fresh surprises it has in store. It controls the entire traffic on our railways, and, as you are swept along in the Irish Mail or Flying Dutchman at the rate of 60 miles an hour, you scarcely realize, perhaps, that your lives are hanging on a single wire.

Scarcely less difficult is it to realize that the speeches in our Parliament have barely left the speaker's lips ere they are flashing to every direction at the rate of 400 words a minute; or that the winner of the Derby will be known in all the great towns of the three kingdoms, before he has passed the post by twenty strides.

The whole business of our mercantile community, extending to every corner of the globe, relies absolutely on the telegraph. When we see the unlimited use they make of it, not only from town to town, or from one country to another, but when we find all their endeavours tend to supplant the human by the electric messenger, to establish their telephone exchanges, connecting house to house, and even room

to room, can there be the remotest doubt of the value of such an auxiliary?

"Our thoughts will now arrive before they're stale,  
And wait no longer on the carrier's ale."

Where money is the object to be attained by success, it may be taken for granted that the means adopted by whole communities to obtain that success are, on the whole, the best means. The broad rules that govern the conduct of war are identical with those, by following which, success in mercantile enterprises is attained; rapidity and unity of action, made possible by the greater or less elimination of time and space in communication, are essentials of both; and when, for filthy lucre's sake, the mercantile world places no limit to the extended use of the telegraph, the example is one which would seem sound to follow, as likely to be practical.

Those who have watched the gradual growth of war telegraphs in the British Army must have observed the great progress made of late years, and the great and increasing reliance which is placed upon them.

Looking away from our own Army to those of other countries, we see a similar progress going on, and in all we see the desire to extend the telegraph to the utmost limits of active operations. This is very clearly pointed out in a most interesting article in the "*Jahrbücher*," of the German Army and Navy for February and March of the present year; the article is by Herr von Fischer-Treuenfeld, who shows how, by their latest organizations, and by the increasing proportion of light cable now being adopted in all armies, a more extended use of the telegraph is clearly foreshadowed.

General von Chauvin, the Director-General of Telegraphs in Germany, in his work on the army telegraphs, states that their tactical use during the war of 1870-71 was only prevented by the fact that there were no telegraph troops that had been trained for the purpose during peace. But it had been clearly recognized in Germany before the war, that the telegraph could be used on the battle-field itself.

In the French Army there is not only outpost cable provided, but each cavalry regiment has six telegraphers with suitable equipment for establishing intercommunication in the cavalry divisions, and for destroying or repairing the lines of the country.

Russia has also an organization for cavalry telegraphers.

The whole telegraph equipment of Spain is of light cable carried on pack animals, and is organized with a view of pushing the electric communication to the utmost limits. Italy, Austria, Belgium, Sweden, America, have all their outpost equipment.

But now we come to the fact, that in spite of all the preparations, there are only a few isolated instances of any tactical use having been made of the telegraph; and I am not aware of its having been thus used to any extent during the great peace manœuvres of Continental armies; for this there must be some cause which universally hinders the progress.

Apart from a certain prejudice existing in many armies against a too extended use of telegraphs, the cause is not far to seek.

To be efficient, a field telegraph must be reliable; and hitherto no organization and no instruments or wire for outpost work have been introduced into active operations, at least in foreign armies, that give reliable results; Commanding Officers have not cared to deal with an uncertain subject.

The feeling, so widespread in our Army, that the telegraph could never be made reliable for tactical operations is, probably, an outcome of the unnecessarily faulty equipment with which the telegraph troop was provided some twelve years ago. At that time endeavours were made on many occasions in the neighbourhood of Aldershot to use the telegraph tactically, and though communication was often established by its means between the centre and flanks of one of two contending forces, yet it was discredited by frequent failures on other occasions. The cause of these failures was nothing to Commanding Officers, their verdict was "the telegraph has failed."

Now all this time the telegraph troop had been trying to "make bricks without straw," to establish communication through cables which age and long days of drill had rendered rotten as ropes of sand, and with instruments wholly unsuited for the purpose. Deaf ears were turned to the remonstrances of those who were in charge, and so the telegraph was discredited for tactical use.

Something of a similar kind may be traced in its history in Germany; an inferior cable, unsuitable instruments, and troops untrained to the work in peace-time, discredited the telegraph for outpost service in 1870-71, and threw back its progress for years.

In the British Army, however, we have arrived at a point where, in the opinion of many, a further development is desirable and safe. We are sure of our ground, as far as we have gone, and are ready for a new departure.

We are also in this position, that we have surmounted the two chief obstacles that confronted our advance, *i.e.*, the want of suitable instruments and suitable wires.

The field telegraph instrument almost universally used on the Continent is the Morse recorder, in one form or another.

The sounder is essentially the British and American instrument; any recording instrument, that is, an instrument in which the signals are received on a tape run out by clockwork, must be delicate, complicated, and unsuitable for rough usage in the field, and could never be efficient for outpost telegraphy.

The chief objections to a cable in the field are, that hitherto it has been heavy, expensive, and, when the wire inside becomes broken from any cause, the fault is difficult to find and repair.

Now Captain Cardew has invented an instrument, a combination of the telephone and sounder, which is simple in construction, and so sensitive to the electric current that it will work in all weathers, through common bare wire lying on the ground.

On the other hand Messrs. Siemens Brothers have produced a cable so much lighter and so much stronger than former cables, that

it will be almost unnecessary to have recourse to bare wire except as a matter of cheapness (see Table).

*English and American Field Telegraph Cable.*

Cable and construction of same.	Total diameter in inches.	Weight per mile in lbs.	Resistance in ohms per mile.	Breaking strain in lbs.
English cable before 1881 of a 7-strand copper wire, covered with india-rubber, taped and braided .....	0·32	301·5	11·7	180·8
English new cable after 1881 of a 7-strand combined copper steel strand, india-rubber taped and braided .....	0·236	170	30·5	271·2
New "Siemens' Light Field Cable," No. 16, of a combined copper steel strand, two layers taped and braided .....	0·188	131	62·7	352·7
New "Siemens' Light Field Cable," No. 17, of a combined copper steel strand, one layer of india-rubber and taped only....	0·134	78	101·3	352·7
English outpost cable, with up-and-down conductor. The up conductor is a 3-copper strand, insulated with silk and gutta-percha. The down conductor consists of eight copper wires, spirally wound and braided .....	0·138	56	67·6	119
U.S.A. outpost cable, only slightly different in construction from the English, smaller in diameter and lighter in weight, but less strength.....	0·118	34	67·6	81·5

During the campaign on the Nile a very considerable use was made of Captain Cardew's earlier forms of instrument which was worked through bare wire lying on the ground for many miles.

Since then the use of such lines has been largely extended in Egypt.

Turning to the nature of the proposals for a further development of the field telegraph, let us first have a clear idea of what already exists in our Army. It may be taken for granted that the trunk communications of an army in the field, from base to front, from headquarters to outlying commands, between army corps, divisions, or brigades, and the intercommunication in camps, will in future be carried out by telegraphy or telephony, and that the organization and means of doing this are recognized as established and reliable; whether by utilizing the existing lines of a country, by erecting light

overhead wires, by laying cables, or by making use of signalling. The thing can be done in any country, and under any circumstances.

Then comes the question, up to what point in the line of the advance of an army, can the main trunk lines be carried?

A field telegraph can be erected as fast as an army can march; that is to say, if proper transport be provided. It can accordingly accompany the headquarters; but would it always be able to do so if the work of erecting the line were carried on in rear of the main body? I think not; the roads would be choked with transport, and the telegraph would come off second best. For this reason the head of the telegraph should be in advance of the main body, and the reserve or main body of the advanced guard would seem to be the point of advance it should keep up with, unless circumstances were advantageous for pushing it still further, and close up to the screen of cavalry, if such existed (see Plate VIII).

Speaking of the campaign of 1870-71, von Chauvin says, "The line was laid quickest when the telegraph detachments accompanied the advanced guard, very often they even preceded the most advanced troops, accompanied by special covering parties. In such cases it happened more than once that the telegraph stations were actually exposed to fire, and sometimes had to retire before the advancing foe."

Assuming then the forward station of the trunk line to be with the reserve of the advanced guard of an army, it is mainly from this point that the proposed new development would take place; and the word "outpost telegraphs" may be adopted to designate all the advanced lines.

The two principal purposes which outpost telegraphs would be used for are—

- (1.) Obtaining information.
- (2.) Transmission of orders.

And for these purposes they might be used in connection with—

- (a.) Outposts.
- (b.) Reconnaissances.
- (c.) On the field of battle.

With outposts, lines might be run as opportunity occurred from the reserves to the supports, and from the supports to the piquets.

Short and still lighter lines might extend from the piquets to special posts, or accompany reconnoitring patrols.

With reconnaissance by cavalry or infantry, light lines might accompany as far as possible according to circumstances.

On the field of battle, lines might radiate from a central station, say the advanced station of the trunk line, to different points in rear of the position. A second radiating circuit might be run from centre to the artillery positions, not only for the purpose of controlling artillery fire, but also to serve as an alternative line in case of accident to the other wire (see Plate).

Of the possibility of using the telegraph I think there can be little doubt, but the advantage of doing so is a debated point.

Under any circumstances no hard and fast rules could be laid down for its use, as the extent of the operations and other local conditions would necessarily modify the requirements in every case. To force the telegraph down Commanding Officers' throats would be to ensure its failure, but to give to them the disposal of a certain amount, to use or not at their discretion, would, I feel certain, ensure its success.

I now come to the matter of organization, and this at once opens up a fundamental question, *i.e.*, would outpost telegraphs be best served and carry with them most success if worked by a special telegraph corps, or by a regimental organization? The trunk lines of telegraph from base to advanced guard, and connecting army corps, divisions, and brigades, are essentially an engineering service, and both Officers and men require a long technical training, not only to enable them to deal with the engineering points, but also for the management of what is often a most intricate matter of organization.

The instrument clerks, moreover, on the main lines must be the best that can be obtained, in order to cope with the immense mass of traffic.

But, on the proposed outpost lines, when the same methodical system would not be required, and messages in great numbers would not be passing, a much lower technical skill would suffice. In making this statement it must not be understood to mean that the higher the technical skill, the efficiency of the Service would not also be greater. For the more the duties of a telegraph clerk have become a second nature to him, the less is he subject to excitement and flurry in emergencies.

Though there is no doubt the Telegraph Battalion would be able, if sufficiently expanded, to work an outpost system efficiently, yet if Officers responsible for the higher or lower commands in advanced positions had not the sole control of the lines and their working, in my opinion the full benefit would not be reaped; and a regimental or brigade organization would seem to be the only one likely to give the best results.

There exist at the present moment many men in infantry regiments who have learnt to work the telegraph. These men have chiefly acquired their knowledge in India, where a system exists of training soldiers from various regiments in the State telegraph offices. The men so trained can very rarely reach to any great efficiency as clerks, because they begin too late in life, and, also, because they are constantly removed from the work for other duties, and do not get sufficient practice. The clerks employed in the R.E. Telegraph Battalion, as a rule, begin as boys in post offices, and through years of practice reach a high proficiency, which is necessary for main line traffic.

Many of the men of other regiments trained as already mentioned, would, however, be perfectly capable of taking the work on outpost lines.

I understand that there is a Committee now sitting in India to consider the advantages of there being an establishment of ten trained



telegraph clerks for every line and cavalry regiment. At home the system of training employed cannot be said to be satisfactory; at certain garrisons, such as Dublin, Cork, Belfast, York, Dover, Plymouth, &c., there are groups of military telegraph stations at which soldiers of the line are employed as clerks, and supervised generally by an R. E. non-commissioned officer who has been trained in the Telegraph Battalion.

They are taught to work what are known as A, B, C instruments; instruments that would and could never be used in the field. Their training is accordingly thrown away for any purposes with an army on service; and they would be far more profitably employed if sounders and telephones were substituted for these other instruments.

There is another point connected with army communications which it might be well to touch upon. As outpost telegraphs are a different thing from the main trunk circuits, so outpost signalling is a different thing from main line signalling. For the latter to be an efficient auxiliary to the telegraph, the signallers should be also trained telegraph clerks, otherwise they are not able to deal with the traffic that passes over our lines in war-time. "Signallers" is rather a misleading name; all are telegraphers, as signalling is telegraphy. In India and elsewhere telegraph instrument clerks are known as "signallers." Would not the terms "electric" or "visual telegraphs" and "electric" or "visual signallers" be better?

As regards the proposed organization for regimental outpost telegraphers, each regiment of cavalry or infantry might have ten trained telegraphers (who would also be regimental visual signallers), an equipment of from  $1\frac{1}{2}$  to 2 miles of light cable, and three or four sets of station material; the whole to be carried on pack animals, or in a light one-horse cart. The weight of cable such as lies before you, being about 70 lbs. per mile, 2 miles would be 140 lbs. Four instruments would weigh about 30 lbs. The necessary batteries and other equipment, about 100 lbs.: taking 200 lbs. as a load for one animal, two pack animals would be required to carry everything, weight of forage, blankets, saddles included.

A light one-horse cart would doubtless be much the more serviceable mode of transport.

The French cavalry equipment is all carried in light one- or two-horse carts.

The Spaniards carry all the telegraph equipment on mules, with a maximum load of 320 lbs. They are quite satisfied that their experience proves that field cable is reliable under all circumstances.

A regimental organization, such as I have sketched out, would have the additional advantage of providing a number of mounted men, trained telegraphers, who, with the cavalry at the front, would be able to restore temporarily many of the lines of a country through which they advanced, and thus considerably facilitate the work of the Telegraph Battalion which followed; they would be able in many cases to establish at once communication through the country lines, or to intercept the enemy's messages, as was frequently done during the American War; and in camp both cavalry and infantry regiments

would be able with their own equipment to put themselves in immediate connection with the central telephone exchange, that we hope to see in all future camps at home or in the field.

In service in the field there are often times when a human messenger is of little use, frost and snow, fogs, tempests, floods, may all in their turn render communication by orderly, and even by visual signalling, impossible, or at least difficult; how welcome at such times would be the service of a wire! Again, many of you must have experienced the great, and what I may call the incidental value of a telegraph line as a guide at night, in thick weather, and even in bright daylight, in countries like the Transvaal, or in the deserts of Africa; you may imagine accordingly how the possibility of giving such directions as "follow the telegraph line" would save many a Staff Officer moments of anxiety as to whether the reinforcements, the supplies, the ammunition, or whatever else he might be forwarding, would reach the intended point at the front. The forward telegraph stations would be centres, *points d'appui*, in direct communication by sure and certain paths with the main body.

In 1882, on the Nile, the bare wire which was laid for many miles across the desert, was used in this way as a guide at night for troops on the march, the men picking it up, and letting it run through their hands.

Having thus laid before you a sketch of some proposals for more rapid and sure communication in the tactical field, a sketch necessarily crude from limit of time, and purposely crude, perhaps, so as to avoid trailing across your path the red herring of detail, which might turn you from the real questions at issue, I would sum up the points for discussion as follows, asking you to take it for granted that the physical difficulties to outpost telegraph lines are overcome.

1. Is it desirable to extend the telegraph to the utmost limits of an army in the field, if circumstances would admit of it?

2. Would an organization for giving effect to this be better carried out regimentally or by the Telegraph Battalion?

3. If the principle of outpost telegraphs be admitted, is not the nature of the service distinct from that of the main lines connecting the various parts of an army, and if the outpost telegraphs be regimental, should they not be carried out by the regimental signallers, who should be trained accordingly, while the signallers for the main lines should be highly skilled telegraph clerks, and belong to the Telegraph Battalion?

I am well aware of the arguments that will be brought to bear against these proposals, and how the British Army is not given to taking new departures to its bosom in unseemly haste; but I bring them before you in the hope that discussion may engender a familiarity which will breed contempt for the idea that telegraphs would cripple individuality, or would crush the independent spirit of an army.

Might not the result be that a confidence would be established by which individuality would be brought out, and enterprise encouraged?

What advanced telegraphs are capable of doing has been illus-

trated on several occasions in the history of war, but never better than in the operations immediately before and after the battle of Tel-el-Kebir, and again and specially at the action of To Frik, better known as McNeill's Zareba, where a light cable run out with the advancing squares opened communication immediately when they halted, and was only closed temporarily for twenty minutes during the fight.

I feel that I may not be looked upon as an impartial advocate for the telegraph, because those who have to deal with it cannot escape the absorbing interest in its work. There is a consciousness that you are wielding an all-powerful instrument for good or evil, and the pleasure of bending to your own purposes the most potent of natural forces is very great. But if this paper should be the means of originating discussion of a subject which sooner or later must make its way, it is all I ask; and having said this much, I may safely leave it to you, gentlemen, to be judged of without favour or affection.

The CHAIRMAN (Lord WOLSELEY): It is now my pleasant duty to ask gentlemen to be kind enough to give us the benefit of their views upon the tactical question which has been so ably brought before us in these two lectures. Major Beresford in summing up this matter has told you the chief points that can be most appropriately discussed, and I hope in the discussion that is now to follow the speakers will keep these points before them, namely, the possibility of making use of the telegraph for tactical purposes, and, generally, the tactical use that can be made of the telegraph in action.

General Sir GERALD GRAHAM: My lords and gentlemen, Colonel Hale expressed the view that there is a great deal of difference of opinion amongst us as to the proposals that he and Major Beresford have brought forward. At all events, there can be but one opinion as to their extreme importance, and of the able manner in which they have been laid before us. The telegraph fulfils a most important condition in modern warfare. If the Staff are said to be the brains of the army, the telegraph may be described as the eyes, ears, and mouth of the army. To the Commander it has a greater relative importance, as the Staff certainly cannot furnish him with brains; but the telegraph, that is the visual and electric telegraph, can give him power of control, and this power is one that, as Colonel Hale has put before us, is visibly falling away from the grasp of Commanders in action in modern warfare. Colonel Hale has given us some illustrations on a large scale of the great disadvantages under which the Commander labours when the component parts of his force have no telegraphic communication between themselves and headquarters. I may be permitted to give from my own experience an illustration on a small scale, over a very much smaller theatre of war. It was at the battle of Hasheen, where at that time the telegraphic and signalling department had only just been taken over by a very able and zealous Officer, and was far from being perfectly organized. The ground was partly bush, and the advanced force was occupying a hill called Dihibat. My position was in rear of this hill; between me and the hill was some bush, and after we had taken possession of the Dihibat hill we wanted to communicate with the advanced force. We could not see what was going on beyond, owing to the incapacity of the signallers to communicate, and I feel how terribly impotent a General is when separated from his troops and unable to communicate any orders. There is no doubt that the course of action on that day would have been different had I been in complete control and able to communicate with my advanced force. I do not ascribe any blame to the force, but as I say the signalling department was not so well organized then as it became later on. The tactical question which we are asked to discuss is, whether it is advisable that Commanders in the field should have the power of communicating orders to distant bodies whom they do not see, and with whom they are not in immediate

communication. It is feared by some that they will exercise undue interference, or, as Colonel Hale says, that it may come to "meddle and muddle." That is a question which concerns the Commander, but I think Colonel Hale has shown us very clearly that the "meddle and muddle" practice may be extended to cases where there is no telegraph, as in the illustration he has given us at the battle of Wörth. The only difference is this, that a Commander who has no telegraph would send orders which might have been correct at the time they were sent, but which would be received under an entirely different set of circumstances, and therefore would be quite incorrect at the time they were received; whereas the Commander who possesses the telegraph can give his orders promptly and at once, and under the existing circumstances of which he has been clearly informed, therefore his orders will have a distinct and practical bearing, which orders given by a Commander who has not telegraphic communication will not have. As Colonel Hale stated, it is only the Commander who is perfectly informed who can have a sense of the proportion of the action. It is, of course, impossible for any individual Commander acting as a unit on the field to have an idea of the proportion with reference to other parts of the field, whereas by means of the telegraph he would be kept fully informed of what is going on at all parts, and of the relative strength of the enemy, and would be able to form an opinion better than any Officer could do who had only seen the part immediately before his eyes. Therefore I think the question of interference cannot be used as an argument against the employment of the telegraph. The position of the Commander is somewhat analogous as regards his troops to his own position as regards the authorities at home, and of course in either case this power must be used with discretion. With regard to the question of organization, that I do not feel competent to give much opinion about, but I think the suggestions made by Major Beresford, as far as I understand them, are very fair, that the regimental organization should be adhered to as far as possible, and I would prefer that the regimental organization should be applied to brigades, telegraph signalling, and from them be transmitted to the headquarters of the Division, and so on to the headquarters of the army; then the regimental telegraph or signallers would work messages to the brigade headquarters, and train signallers from the telegraph battalion would take them on from the brigade headquarters. I entirely agree with what has been said about the great advantage of signalling for cavalry. I have always been of opinion that much may be done in modern battle-fields by the use of electric signals. For instance, take the case of artillery, instead of massing artillery in order to get the effect of combined action, it may be possible to obtain a concentrated fire from many guns by controlling it from some central position which would give far greater power to the artillery, and at the same time the mass would be under the control of one man. Major Beresford has alluded to the use of the telegraph at the action at Sir John M'Neill's Zareba; I think that is an illustration of the great possibility of working telegraphs in action. As far as I could make out the telegraph was working before the action was quite over, and the account of that action was sent direct from the field to the newspapers. I do not give that as an illustration of the use to be made of the telegraph, but I may also add that Sir John M'Neill telegraphed the result of the action to Suakin, and thereby prevented a panic which was very likely to have arisen. The telegraph was therefore very important in that respect.<sup>1</sup>

Major-General WEBBER: I have carefully read over the two papers with which the meeting has been favoured, and I cannot help feeling that the subject is one which has been brought before the Institution in a most interesting and enlightened way. The Officers who have read these papers wish, I imagine, to impress on the authorities of our Army the desirability of extending the use of telegraphs not only for outpost duty, but also over the area actually occupied by the field of battle. The subject is one which I am bound to say has often been considered before, though never so prominently brought forward before a military audience. I think

<sup>1</sup> I did not mean by these observations to advocate the employment of the telegraph in the fighting line, nor do I believe it would, as a rule, be practicable to make use of it under fire.

that there is no Officer in the Service who has been engaged in signalling, either during peace manœuvres or during actual operations, who has not been greatly impressed with the importance of means of rapid communication between a Commander and his tactical units: but I also think that every Officer who has been so engaged has not only been impressed with the difficulties of securing such a means of communication, but also with the disasters, or rather the dangers, that exist in the event of such means of communication failing at a moment when possibly the Commander was relying entirely upon them to obtain the results upon which perhaps much of his success would depend. From that point of view I have read these papers, and I have been more and more impressed with the belief that nothing can be more dangerous than that any practical steps should result out of theorizing under such conditions as have been here described. I would ask any Officer here, and we are very fortunate in having two or three, if not more, who have been in command during extended operations in the field in the presence of an enemy. I would ask them (and I am sure it has come home to them very often), which would they rather depend upon, sending an important order or receiving an important communication through a means which would depend upon the safety of such a line of wire lying on the ground, or on the more delayed but more sure means of carrying such a communication by means of one or more mounted messengers? There is no doubt that such messages ought to be written, and should be carried, and always have been carried in former times by mounted messengers. The fact that such important messages have been sent by several hands simultaneously shows the importance which Commanders place on the accuracy and the certainty of the transmission of such orders, and although it is quite possible if the Commander is in communication with the tactical unit by telegraph to send that message by mounted hands if he finds that the telegraph has broken down, still there has been to my mind always a great danger in inducing him to rely upon the instantaneous means of communication, perhaps to put off what he would otherwise have sent by mounted messenger, allowing sufficient time for the man to travel, until he finds that the wire is broken down and it has become too late to recover lost time. It has been always in that aspect that I have regarded the attempt to use what may be called tactical telegraphy. It may be a very prejudiced view to take, but I can only say it has been the result of a great deal of thought over this matter, with some partial observation and experience. That the use of the telegraph has been applied in this way to manœuvres in our own Army is known to many present, and I think that wherever the field telegraph has been definitely given some task to perform during a day's manœuvres, that is to say, to establish communication between two points, it has done its work very fairly, and under conditions of liability to injury to the plant which would not be very different from those which would arise in actual warfare. I am sure that the present means at our disposal of telegraphing from the field of battle to the base if extended to meet all the wants of an army in that respect are sufficient, but the moment we come under conditions such as those in which outposts would be placed, such as moving advanced guards and so forth—the moment we come to place reliance upon this means, which becomes the more precarious the more it is used in situations in which it is more liable to injury, I think we are running into a certain amount of danger. I have always thought the conditions under which that danger least exists have been those of visual signalling, but if I understand this paper it is not for the purpose of advocating the use of visual signalling *only* during tactical movements, but it is the use of mechanical appliances in which both electrical instruments and skilled clerks are necessary. I cannot quite agree with Major Beresford in believing that a telegraph clerk may be less skilled under all the difficult conditions of an action going on than is requisite under those conditions in which he is placed when working in an office. His argument is that the clerk working in the office requires to be especially skilled because of the "immense amount of work he has to do." Now although to get through an immense amount of work skill of a peculiar kind is required, I think that the clerk would need really more skill, experience, and coolness when working under those conditions which exist when two places are in communication during an action. Anyone who has read the very interesting accounts of the use of telegraphs under fire and during action in the American War of Secession will recollect that the so-

called "signallers" first employed were men who were only half trained and with very inefficient knowledge of how to use the means at their disposal, whereas the men who eventually distinguished themselves in the most remarkable degree in maintaining communication during action were the old trained telegraph clerks of the United States National and Telegraph Service, or the services of the Companies who then worked the telegraphs in the States. I do not like to detain the meeting any longer, but I have not said one-twentieth of what has come into my mind to remark on these papers. I do think that we ought in the future to be more and more careful as to how we use our telegraph. I hope that we shall never attempt to do so under conditions in which it may become the cause of trouble and a source of miscarriage for the Commander who places reliance on it under circumstances in which it was never meant to be applicable.<sup>1</sup>

Lieut.-Colonel JELF, R.E. : I am sure we are all very anxious to know what are the feelings and wishes of the many distinguished Officers who are present, many of whom have commanded troops in the field, upon this question of the employment of telegraphs in actual warfare. We especially wish to know their opinions on the two great points that have been referred to, first of all as to getting a greater control over the lower leaders; and secondly, as to obtaining rapid information from all sides which may be of great value to them. It is therefore a matter of regret to me that we have not yet had the opinion of any Officers other than Engineer Officers upon this most important question. I may perhaps be able to give a few personal experiences connected with the employment of the telegraph which may be of use, but I should have wished they could have come later in the proceedings. I must confess myself to be one who in common with my great telegraph chief, Major-General Webber, has been a profound disbeliever in what is popularly known as outpost telegraphy. That may be partly due to the fact that I was one of the first Officers in the original Telegraph Troop, when certainly, as Major Beresford has clearly pointed out, our instruments and apparatus were of such a nature that no satisfactory results could be obtained. Some of us at all events contracted a sort of horror of the cable which we cannot shake off, even under its present most altered conditions. I do not suppose that I or other Officers who served with me will ever get over the feeling of uncertainty which resulted from the use of the original cable. At the present time we are provided with an infinitely better cable and instruments, but no doubt that feeling of uncertainty will to a certain extent remain with us in all considerations of this matter in the future. When we come to consider the question of outpost telegraphy, it is very important that people should bear in mind that "outpost" is a perfectly relative term. If we take the question of outposts, as we have had it described to us to-day by Colonel Hale, involving brigades, Divisions, Army Corps, and such like numbers, I think the question of outpost telegraphy becomes a very different subject from what it does when it is a question of outpost telegraphy for regiments; extended we will say on Caesar's Camp at Aldershot, which is the way I have seen outpost telegraphy applied. When it comes to a matter of Army Corps, such as has been described, then the putting of different branches of the outposts into communication with headquarters is a very different matter, and I am happy to say in the latest accepted constitution of the British Army the organization of the Telegraph Battalion is such that there is not one of those operations described by Colonel Hale that would not have been perfectly within our competence at the present moment. If the Crown Prince were commanding an Army Corps, he would, if in our Army, in addition to 300 miles of

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<sup>1</sup> This is the proper occasion to record that to Captain Cardew, R.E., is due the credit of devising a telegraph instrument which is of such a kind as to make it practicable to use telegraphs under conditions of a more precarious nature than heretofore. The interesting examples on record in which Captain Cardew's telegraph has been successfully used prove that his invention was an important step in the direction of an elimination of more than one of the objections in the past to the employment of a ground cable, and the writers of these papers are right in laying stress on that advance in military telegraphy as a leading feature in rendering more possible the application which they advocate.



air line—keeping him in communication with his rear and also with his brigades and Divisions—have had 100 miles of cable with which he would be able to do everything that has here been laid down as a necessary part of the operations. But if we come to lower units, and the question arises as to what regiments can do, between battalions, companies, small pickets, and so forth, then I think matters are on a very different footing. Then I think the present Telegraph Battalion is not qualified to undertake operations that are in advance of the main positions of brigades, Divisions, and Army Corps. No doubt, if tactical commanders tell us it is desirable to have telegraphic communication with such small units as that, then some new organization will be necessary, and some regimental system must be invented that will provide small quantities of outpost cable—2 or 2½ miles I think Major Beresford spoke of—that each regiment should have for their own operations. And this leads me to a point in connection with this matter, which is that I believe the regiments already possess in their signallers the very organization that ought to be used for learning this outpost telegraphy for themselves. I think great encouragement is now given to good men to become signallers in regiments, and it would be an additional encouragement if those who are specially good were helped to make themselves efficient in electric telegraphy. I know “flag wagging” beyond a certain point does not conduce to increased intelligence, and a certain amount of their time might well be given to learning electric telegraph manipulation. Even if a man did not come to be a very able telegrapher, he would be a very useful man for this sort of regimental organization in the future. And not only so, but I have expressed the opinion very strongly here before, that the help we get or hope to get from the Army at large in telegraph operations is absolutely at a minimum. I believe there is an organization in India from which we now and then pick up individual men, but in stations I have served at, Gibraltar, Halifax, Aldershot, and other places, the number of line soldier telegraphers who serve the offices are so few, that if a man goes wrong, the authorities always have to call upon the Engineers to make him good. I do not wish to particularize, but occasions constantly happen where a man who is drawing his sixpence a day as a telegraphist in one of those telegraph offices at camps, commits himself, and has to be punished. Great inconvenience arises to everybody concerned. We have to send a man, a first-rate telegraphist, who instead of keeping himself in training, is hanging about in the office all day long, sending two or three messages a day! And there is universal rejoicing when the man finishes his punishment and is able to take his sixpence a day again. This is certainly very unsatisfactory. This sum is hand-some pay for men who get off all duties, and there ought to be more encouragement held out to infantry men to qualify themselves in electric telegraphy. If that were carried out, I do not say we should have a first-rate reserve of telegraphers, but at all events we should have men who would be thoroughly useful when these small organizations are required for the more advanced outpost telegraphs, if they are ever adopted. I may mention another advantage that there would be in teaching signallers telegraphy, and giving them a small equipment. It constantly happens that a line of visual signallers finds itself entirely upset by some small obstacle, such for instance as the place in which they are working being a long level plain, or a wood coming in which absolutely obliges them to have stations ridiculously close together, and I think, in fact I know from experience in South Africa, that there have been many occasions when the power of being able to lay ½ mile, ¾ mile, or 1 or 2 miles of cable—if they could have read the instrument—would have been a great advantage. I have offered signallers such a cable myself, but they could not use it. If they were electric telegraphers they might make it extremely useful, saving themselves signalling stations and much wear and tear of mind. I think it would be a great encouragement to the signallers of the Army, if regiments that proved themselves, in the competitions that take place annually, to be in advance of their brethren could be given some outpost telegraph equipment—3 or 4 miles or something of that sort—and could be encouraged specially to qualify themselves to become electric telegraphists as well as signallers—we should then have this question at least, the personnel and equipment of the smaller outpost telegraphs, satisfactorily settled.

The CHAIRMAN: During the course of Colonel Hale's lecture, he gave a very interesting outline of the Battle of Wörth. We possess the great advantage of

having an Officer here to-day who was present at that action, and I am sure you will feel that I am justified in asking him to give us the benefit of his experience on that occasion,—I refer to General Sir Beauchamp Walker.

General Sir BEAUCHAMP WALKER, K.C.B.: I am not sure, my lords, that I can add very much to what we have heard from Colonel Hale. Though nearly eighteen years have passed since then, I have a very strong recollection of that eventful day, and on Colonel Hale's writing to me to tell me that he was proposing to interpolate in his pleasant lecture an instance connected with the conduct of affairs on that day, I set to work to a very agreeable task to me, to study up again all the information that I had on the subject. I found unfortunately there was very little. The Battle of Wörth was so entirely unexpected, and so entirely unwished for, that after getting to the field it was to a certain extent a day of confusion, that is to say, the events were so rapid and so important that one had very little time to dissect the causes that led to them. I perfectly remember the night before being told that there was no intention of fighting on the 6th, that the army was to wheel to the right,—it was then facing south, and was to take up a position facing to the west,—and that the Crown Prince fully anticipated fighting on the 7th. Very early in the morning one was roused by the sound of firing, and turned out to hear what was the matter. I went straight to headquarters and inquired, having my horse saddled at the same time. I did not see the Crown Prince or the Chief of the Staff, but I was told by one of the superior Officers that it was pretty well ascertained it was only an affair of outposts, that the intention was to break off the action as soon as possible, and not to fight till the next day. However, being at that time a tolerably old soldier, I did not go back to bed, I kept my horse saddled and I went to breakfast at a small cabaret immediately opposite the gate of the château which was the Crown Prince's quarters. While I sat at breakfast, I saw the Crown Prince, accompanied by my old friend Blumenthal and two or three others, ride out and take a certain road. I sent my servant for my horse; it was brought very soon, and I arrived on the field a very few minutes after the Crown Prince. At that time, events were considered to be in rather a precarious condition. I perfectly remember when riding up the last hill before attaining the top of the plateau which covers the right bank of the Sauerbach having passed, I won't designate him any nearer, a gentleman of very high rank in Germany who, with a doleful face, said to me, "Good morning, Colonel, things are going very badly, very badly indeed!" to which my natural remark was, "If that is the case, Sir, the sooner I join the Crown Prince the better," and I rode on. When I joined the Crown Prince, I found that that was not the real state of affairs, and that, on the contrary, as far as he could acquaint himself with what was going on along the very extended line on which they were fighting, he was tolerably well satisfied with the course of the day. I may mention that some time afterwards I was told by an Officer, whose information I was perfectly satisfied in taking as a fact, that it had not been intended originally that the 11th Army Corps should take any part whatever in that battle, at any rate at the commencement of the action, but the intention was to attack the enemy along the line of the Sauerbach with the 5th Army Corps and the two Bavarian Corps, while the 11th Corps was to march directly on the railroad which was in rear of about the centre of the first French position, but that in consequence of the action being hurried on in the manner so excellently narrated to you by Colonel Hale, the 11th Corps was not only obliged to take part in it, but a very serious part, and was effectually prevented from marching on this point, which would indubitably have involved the surrender of the whole French Army. I do not know why Colonel von der Esch, of whose death I am very sorry to hear to-day, who was Chief of the Staff of the 5th Army Corps, was sent to the front to take upon himself the important step which he appears to have taken. I can only account for it by saying that the General Commanding, who had been very severely wounded in the action of the 4th before Weissenbourg, was perhaps not as mobile as he always was when fighting took place. On turning over my draft despatches to-day, I find that I particularly mentioned in them that General von Kirchbach was too unwell from the wound he received on the 4th to remain long on horseback, and that when the Crown Prince and his Staff came up to the 5th Corps, he was directing their operations on foot. That we had no telegraph on that day was no doubt a very

great misfortune, and I am entirely unable to account for it, excepting that at that time the amount of telegraph organization in the Prussian Army was so small that it most probably was with the King. I can only account for it in that way. I have no reason for saying so, but thinking matters over I can only give that reason for it. I know at the close of the action when the Crown Prince asked me to ride over the battle-field with him, I was obliged to ask him whether he could enable me to telegraph to the Secretary of State for Foreign Affairs for Her Majesty's information, and he told me there was no telegraph nearer than Zultz; on which I asked His Royal Highness's permission to ride back to Zultz and telegraph, which I did. Now, I will give you an amusing illustration of the way in which history is written. All of you know that in disputed wills and questions of genealogy, tombstones are very often consulted. Beyond that, perhaps a hundred years hence pictures may be consulted, and there is a very excellent historical picture in Berlin, I think in the Crown Prince's palace, in which the Crown Prince is represented as entering Reichshoffen with your humble servant immediately behind him. When I went to see the picture, I said to the artist, "My dear friend, I was not there at all, I was riding back as hard as my old horse would carry me to Zultz to telegraph to England." "Ah, but," he said, "you know, Colonel, I was so anxious for a bit of colour, I wanted your red coat," whereas I wore a blue coat during the whole campaign, and never produced the red coat till we arrived at Versailles. You may imagine, therefore, how little I deserved to be depicted as riding into Reichshoffen with a red coat. I suppose one is very fond of one's own children, and I became so interested in looking up one or two things in my draft despatches that I read on till I very nearly lost my morning's walk, and there I tumbled on a curious fact which had quite escaped my memory. This may also be an illustration of how history is written; it may also be an absolutely incorrect fact. At the close of the Battle of Sedan, the good old King came forward to me with great warmth and shook my hand, and spoke to me in such terms, that I ventured to say to His Majesty, "I have no possibility, Sir, of telegraphing to the Queen to-night, unless your Majesty will help me. I believe there is no telegraph within reach of the army to which I can ride to-night." "Oh," he said, "I should like you to telegraph to the Queen extremely; you shall send your message by my messenger," and I find in the despatch which I wrote in Donchery on the next day I say we were cut off by 8 German miles<sup>1</sup> from telegraphic communication, which I can hardly believe. It is almost incredible, after knowing the facilities which can now be afforded by telegraph, that such a thing could have happened in the year 1870; but here it is, I have copied the words of my despatch as they were written: "Cut off by 8 German miles from telegraphic communication, and my telegram could only be forwarded by the special messenger from the King's headquarters."

Major ALLATT, Duke of Cornwall's Light Infantry: I rise with great diffidence to make a few remarks. Of telegraphs I have no practical knowledge, neither have I made tactics a special study. As a regimental company commander, the humblest of all tactical leaders, I must confess to feeling some sympathy with those lower leaders who, in the opinion of one of the lecturers, often furnish the fool at the thin end of the chain of military control, and who, although at times they may condescend not to take the initiative, can it appears generally be depended upon to take it, and so form a wrong idea of the situation. As however I have for some time past taken some interest in the different means of communication used in military operations from telegraphs down to pigeons, I should like to be permitted to make some observations. The suitability of the field telegraphs to active operations, and especially to what has been termed "advancing warfare," does not admit of doubt. The proposal to extend the use of the cable to outposts, that is, beyond Army Corps, to Divisions, brigades, and even battalions, opens out a large field for discussion. There is a good deal of difference of opinion as to the desirability of extending the use of the field telegraph to small tactical units. It is very remarkable that in spite of their experiences in 1870-71, the Germans continue to be satisfied, or were satisfied up to this time last year, with a comparatively very small amount of

<sup>1</sup> 37 English miles.—B. W.

telegraphic equipment. We were told twelve months ago by Herr von Fischer-Truenfeld in this theatre, that they have not increased, but have rather lessened, the proportion of their field telegraphs, which is now much below that of any other military European nation. They have only four sections for every six Army Corps, the proportion in other countries being at least two sections per Army Corps, which latter organization permits the extension of the use of the cable to Divisions, and in exceptional cases to brigades. They still rely upon the antiquated method of signalling and gallopers. It would be satisfactory in a discussion of this nature if some one were able to give reasons for such an economy in the use of German field telegraphs, seeing that while we are considering the question of outpost telegraphy they have not yet arrived at the conclusion that a telegraph section with each Army Corps is worth the trouble and expense of training and maintenance in peace-time, and of transport and use in war. It is evident that for European warfare in which large armies take part they do not believe in tactical outpost telegraphs. At the same time we can quite appreciate what Colonel Hale has said as to the desirability of keeping troops as long as possible under the direct command of the responsible chief, who may have planned an attack or other operation. The field telegraph organization of foreign armies (Germany excepted) is a proof that there is very little difference of opinion on this score. The question before us is how low down in the scale of tactical units the use of the cable on the battle-field is to be applied. Major Beresford has suggested a telegraph equipment for each battalion. I do not think, however, he has adduced any instance of want of success owing to the failure of the usual method of communicating between small bodies, such as between battalions and brigade headquarters in action. Let us for a minute apply the crude principle of outpost telegraphy to a Division. The front of a Division acting alone and formed for attack is given in our drill book as from 1,260 to 1,700 paces, and the depth (which will continually decrease as the action proceeds) as 2,050 paces. The interval between the first and second lines is 850 paces. Is it to be expected that the difficulty of rapidly conveying orders within this area of about 1 mile square will be such as to warrant the establishment of the proposed regimental equipment? Imagine for a moment half a dozen cables within this space allotted to the Division radiating from the reserve battalion to those in the first and second lines, with guns, cavalry, ammunition carts, ambulances, and galloping orderlies frequently crossing them. I am afraid that even the newest and most improved cables could not stand such treatment for long. In our last expedition to Suakin the cable was, I believe, broken every night either by the enemy or by our own baggage animals. The amount of additional transport necessitated by this outpost telegraphy has also to be considered, and we must bear in mind that every man who works the telegraph is taken out of the fighting line. If the signallers are to furnish the telegraph detachment, additional men will still be required. The Germans, whose organizations we are accustomed to look upon as models, do not believe in this universal telegraph cable system on the battle-field, and it appears to me we can hardly wonder at it. The conditions which govern Continental organizations do not, however, always apply to our own Army—the use of the field telegraph is an example. With us an European war is a more or less remote contingency, but we have always to be prepared to take part, at short notice, in far distant operations, and in inhospitable countries against semi-civilized enemies. In such cases telegraphic communication becomes a necessity, and has to be provided by our Royal Engineers, little or no assistance, as a rule, being obtained either in the way of plant or men from local sources. Hundred of miles of wire may have to be laid over a rough and unsurveyed country, and then to be worked and maintained, often with an inadequate number of men. Trained telegraphists who may be required to replace casualties or to increase the strength, have to be sent out across thousands of miles of sea and possibly hundreds of miles of land before they are available, and in a campaign of any duration, constant additions would be required. In such cases the assistance of trained regimental telegraphists who had accompanied their battalions on service would be of the greatest value. Then, again, in these wars the action of small bodies such as companies and battalions is often of the utmost importance, and there would, I venture to submit, be scope for the beneficial use of the battalion cable equipment. For such warfare

the more independent and self-supporting we can make our fighting regiments the better.

Herr VON FISCHER-TRUENFELD: May I be allowed to make a few remarks to explain why the field telegraph could not be used by the Germans in the extensive way that has been suggested by Colonel Hale? And these remarks may also perhaps serve as an argument against General Webber's objections to tactical telegraphy. The two most essential conditions of a tactical telegraph are: easy transport and reliability of the line-conductor, which are identical with great lightness and high breaking strain of the cable. Major Beresford distinctly expressed the opinion that we want a lighter and stronger cable than has hitherto been used, and that this is a condition absolutely essential to the establishment of tactical telegraphy. Let us suppose the case of an army consisting of three Army Corps advancing rapidly, say 9 to 10 miles a day. In order to daily connect only the headquarters of these three Army Corps with the general headquarters, not speaking of Divisions and brigades, about 124 statute miles of field cable would be required. Now, taking the state of the field cable during the year 1870, let us suppose that the old English cable, having a breaking strain of 180 lbs. and a weight of 300 lbs. per statute mile, and supposing each cable-wagon capable of carrying 2,650 lbs., the old English cable would require seventeen cable wagons and 100 horses to transport it; the use of such or similar cables was therefore impossible for tactical telegraphy. Now take the case of a newer cable marked No. 17, which I had the honour to lay before you in April last year, on the occasion of Major Beresford's last paper. With this cable, having a weight of only 77 lbs. per statute mile, and a breaking strain of 350 lbs., the necessary 124 statute miles would only require five wagons instead of seventeen, and only twenty-seven horses instead of 100, and I think with such a cable tactical telegraphy would be possible; especially if we consider that at Tel-el-Kebir that possibility had been proved with a much less favourable cable, having a weight of 170 lbs. per statute mile, and a breaking strain of 271 lbs. Thus the cable used at Tel-el-Kebir for the same length of 124 statute miles would have required ten wagons and fifty-eight horses. There is on the table a still lighter cable which weighs only 57 lbs. per statute mile, and which would only require for the same length four wagons and twenty horses, instead of with the old English cable seventeen wagons and 100 horses. Great weight for transport made the tactical use of former field cables absolutely impossible. If you further take into account the breaking strains of those older cables, say, for instance, the old English cable which had a breaking strain of only 180 lbs., and compare this with Messrs. Siemens Brothers' new cable No. 17 having a breaking strain of 350 lbs., you will find that the breaking strain is twice as large in the new cable as in the old one, besides that the new cable has only a quarter the weight of the old one. These figures speak very much in favour of the practicability of tactical telegraphy.

Lieutenant-Colonel HAMILTON, R.E.: The few remarks I was going to address to you have nearly all been anticipated by other speakers. I will, therefore, only say a few words upon the question that Major Beresford raised as to whether the organization of advanced telegraphs should be regimental or should be performed by separate corps. Now if outpost telegraphy be required in addition, it must be remembered, as regards the personnel, that every man that you take away from his regiment to attend to such work is one rifle less, and that is therefore a disadvantage in such a system. Again, if you distribute the matériel in small quantities of  $1\frac{1}{2}$  miles or 2 miles to each battalion, Commanding Officers would very seldom find a use for this small quantity, but when a distance of 3 miles was required to be covered by a light line there would not be enough cable for the purpose, whilst at the same time there might be plenty of other units on the ground that were not being used. I therefore think that all these units should be brought together, in such quantities as would be furnished to a Division where under the responsible Officer they could be made use of with greater practical utility.

Colonel LONSDALE HALE: I do not deal with the *modus operandi*, I do not go so far as Major Beresford, I only deal with the matter of principle. At Aldershot the other day we worked with the outposts about 5 miles from the main body. I have only to reply to my friend General Webber, who is so very careful

about the introduction of this very delicate thing called telegraphy. In the old days we used to send supplies of food and everything else by horse and wagon along the roads, and then there were certain things called railways brought in, and I have not the slightest doubt that when it was proposed to connect an army to its base by a railway, some one said, "Oh, this is a most delicate thing, the destruction of one bridge will bottle the whole concern; therefore we will stick to our horses and roads." I cannot help thinking my friend General Webber is exactly in the same position; he wants to stick to his horse and his road, and he won't use the telegraph. It is not a choice between the one and the other; it is simply using the best and having the other in reserve to fall back upon.

The CHAIRMAN: I am sure we have all listened with the deepest interest to the very interesting lectures that we have heard. I cannot help thinking most of the students of war who are present will agree with me that telegraphy has a great tactical future. I will even venture to say, that as far as my poor genius and intelligence allow me to judge, the nation and the Army that will be the first to thoroughly work out and apply a sound system of telegraphy as an aid in all tactical combinations—that the General who is able to do so during the progress of an action, will have on his side a very great force which will give him a great number of chances in his favour. I have listened very attentively to all that has been said, and having read these lectures very carefully, that is the conclusion I have come to. It has been very interesting to me to hear remarks made by some who have spoken, which amount to this: "Why don't we immediately adopt this practice? Why don't we immediately have some men of each battalion and of each regiment of cavalry thoroughly trained in telegraphy?" I think the answer is a very simple one. I believe myself in novelties such as Colonel Hale has referred to, and I think the more the "novelties" adopted into an army, the better it is for the army and for those concerned. Napoleon said you should change your tactics frequently, once every ten years if you wish to succeed, and I believe the nation that will adopt and introduce "novelties" most rapidly into its army will have the best chance of success in war. I do not think, however, that the difficulty of making any change in our Army that involves the smallest expense is quite fully appreciated by those outside the charmed limits of official life. You may make up your mind that it is most desirable to instruct your men in the use of new instruments of war: you may find it absolutely necessary in order that your army should be thoroughly efficient to have it provided with breech-loading guns and magazine rifles. You may be certain you ought to have corps of cyclists, and that many novel inventions should be adopted and applied to your Army; but I should like to see any of the gentlemen who have those theories in their heads go to the War Office and ask to have expensive weapons and complicated telegraphic instruments provided for the use or instruction of their regiments. What is our position at the present moment? It is not only in telegraphic instruments that our Army is deficient; we are sadly in want of great guns of a modern type for our fortresses both at home and abroad. Study the subject yourselves and see what is the condition of our forts at home and abroad at this present moment. I do not hesitate to say they are in a condition which is discreditable to the nation, and discreditable to everyone who is responsible for them. If you ask, for instance, for machine-guns for your army or for your fortresses, what is it that takes place. I am sorry to say the process gone through involves a great expenditure of pen and ink and an enormous expenditure of patience. Your proposition goes backwards and forwards from one person to another, between gentlemen who perhaps had never heard of the invention before; notwithstanding this fact, they conceive it to be their province to write long minutes upon it. One gentleman writes to his friend in the next room, who passes it on to another, and at last, after a lengthened period, it reaches perhaps the Secretary of State for War, who, upon the advice of his financial friends, tells you he is very sorry there are no funds to provide the guns or stores demanded. Sometimes, if any of such requisites are urgently asked for the Army, one is told that if he can find some means of reducing your demands in another direction they may perhaps then be able to buy some of the machine-guns, &c., demanded; in other words, if you can reduce the fighting strength of your Army in men, it may be possible to give you a few more carts and horses. In

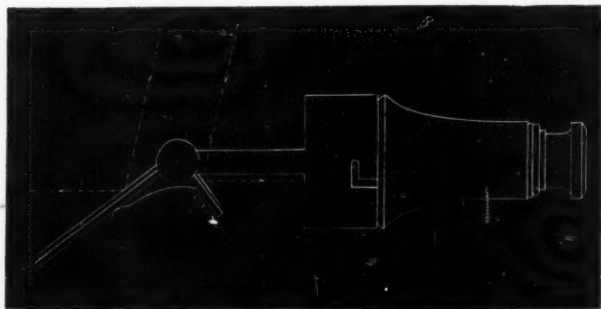


fact, if we are to continue the system that has been pursued hitherto, namely, that whenever any necessity arises for any increased expenditure upon guns, stores, equipment, &c., in order to pay for them it is necessary to knock off a certain number of men from your Army—of fighting cavalry soldiers and fighting artillerymen and fighting infantry—we shall arrive before long at a condition of things when the fighting strength of our Army will be little over the proverbial “two men and a boy.” We shall soon have an Army absolutely unsuited and unfitted for the work we have to do. I think you all know that it has been the earnest endeavour of the authorities in the War Office for some time past to organize a small army, to have it in thorough condition so that if any untoward event should arise we might be able to embark it and send it abroad if necessary. The limit of this Army has been very modest indeed, it has been restricted to two Army Corps and one cavalry Division. The military departments of the War Office have been for many months past most earnestly endeavouring to bring about the preparations for this mobilization. I think I am justified in saying as far as the men are concerned that we have them, and that if we had to send them abroad we could have them ready to embark almost before, certainly as soon as, the ships could be provided for their conveyance. This small army has been provided not only as a nucleus of a great force for the defence of this country, but also, if necessary, to send it abroad; that necessity might arise at any moment, because you not only have very serious responsibilities abroad, but it is evident to every student of war that you may often succeed in defending your country most successfully by attacking your assailant in his own home; these two Army Corps are, therefore, not only provided for the defence of these coasts but also if necessary for offensive-defensive operations; that is, in other words, for embarkation and conveyance to any distant part of the world where you conceived your enemy to be most vulnerable and where you had made up your mind that it was most advisable to strike him. It is vain to hope we shall obtain complicated telegraphic instruments, when I tell you that at this present moment we have not all the stores required for these two Army Corps, that we have not got the amount of transport matériel necessary for them. I think you will, therefore, understand why it is I believe that although it is very interesting to study the use of instruments like those before me, yet there is little chance of our being able to obtain them for the Army under present circumstances. It is unnecessary for me to enter in any detail into the discussion which has been so ably carried on. I content myself with this statement, that I cordially agree with all that has been said upon the advisability of establishing such a telegraph system in the field whenever it is possible to do so. I have great pleasure, and I am sure that I merely echo the wishes and feeling of everybody present, in conveying not only to the lecturers but also to Sir Beauchamp Walter, who so kindly addressed us, and to the other gentlemen who have taken part in the discussion, our thanks for the interesting and able manner in which this subject has been generally treated here to-day.

## A NEW HELIOGRAPH.<sup>1</sup>

By THOMAS H. BLAKESLEY, Esq., M.A., C.E., Royal Naval College,  
Greenwich.

SOME time ago I had occasion to turn my attention to the construction of an instrument which should be portable and at the same time capable of throwing a flash to any given visible point, and one so far distant (five, ten, or more miles) that there was no means of following the path of the ray by the eye itself. The arrangement carried out in the instrument exhibited, to a certain extent fulfils that requirement. The objects of the heliograph were two—first, to send a ray in the direction desired; and secondly, to have some test by which the sender was sure that the ray reached the desired spot.



The fulfilment of these conditions in the instrument exhibited depended upon the fact that, if two mirrors are placed at right angles, and receive portions of the same beam of light in such a way that the direction of the beam is at right angles to the line of intersection of the mirrors, the two portions of the beam would be reflected in directly opposite directions. If such a system of mirrors is placed at the end of a telescope or tube directed to any spot, and be turned about the axis of the tube and about the line of intersection of the mirrors, until an eye looking through the tube receives an image of the sun from one mirror, this fact will serve as a test that the portion of the beam from the other mirror is reflected in the direction of the tube. In the instrument shown the mirror nearer the telescope was merely a piece of unsilvered glass. The two mirrors are kept up to perpendicularity to each other by a spring; the near mirror may be clamped, and signalling carried on by forcing the further mirror out of its position. This plan would give signals as breaks in a per-

<sup>1</sup> Exhibited at the Meeting on 9th March, 1887.

manent flash. A small modification would enable the instrument to give bright signals.

The heliograph could be attached to any opera glass or telescope. The weight with opera glass is only  $11\frac{3}{4}$  ounces complete. The instrument had been shown to Captain Drake, of the Royal Marine Artillery, and to Captain Kish, who had had considerable experience at Suakin in heliography, and both those Officers had suggested slight improvements, which could easily be carried out. As regards the power of the instrument, the area of the glass was four square inches. I tried a similar instrument last summer in Switzerland with a glass of an area of less than a square inch, and found that I could throw a flash for four miles with considerable accuracy. I hope to test it further during the ensuing summer.

A vote of thanks was passed to Mr. Blakesley for the explanation he had given.



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Wednesday, April 20, 1887.

ADMIRAL HENRY BOYS, Vice-Chairman of the Council,  
in the Chair.

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H.M.S. "AJAX"—THE ALTERATIONS LATELY MADE IN  
HER, ILLUSTRATING THE TRUTHFULNESS OF THE  
RESULTS OBTAINED BY EXPERIMENTS ON HER  
MODEL IN THE TANK AT TORQUAY.

By R. E. FROUDE, Esq., M.I.C.E. (Admiralty Experimental Works,  
Gosport).

It is probably unnecessary to remind Naval Members of this Institution that when H.M.S. "Ajax" was first sent to sea, her steering qualities were found to be very defective.

The most remarkable and perplexing, as well as most objectionable characteristic of the behaviour of the ship, consisted in the fact that to keep her upon a straight course required a large angle of helm, sometimes to port and sometimes to starboard; remaining either the one or the other unchanged, it might be for hours or even days together; but occasionally, and without the least warning or any apparent cause, changing sides, and then again remaining for an indefinite period in the new position.

At moderate speeds this tendency was much less conspicuous than at high speeds, and up to speeds of 10 knots or so, the ship was sufficiently under control to be able to manœuvre safely with a squadron. With increase of speed, however, the angle of helm carried increased rapidly, so that at high speed the magnitude of this helm-angle, coupled with its liability to reverse its direction unaccountably at any moment, rendered the ship positively dangerous for steaming in company or in narrow or crowded waters. The helm angle carried at full speed (13 knots) was at times no less than  $18^{\circ}$ , and on the occasions of the sudden and unexpected reversal of the direction of this helm tendency, the ship would fly off at a right angle before she could be mastered by reversing the helm.

The "Ajax" is a vessel of great proportionate beam and moderate draft, very flat-bottomed, and of full lines, the run in particular being unusually full. It was in accordance with experience that such a character of form should conduce to inferior steering qualities, and although the specially dangerous development of the tendency to require helm on a straight course which was manifested in the "Ajax" (and her sister ship the "Agamemnon") had never been before

encountered in anything like so aggravated a form, this tendency was not an entire novelty. Notably, some phenomenon of the kind was observed in some of the full speed trials of the "Northampton" and "Inflexible;" the latter ship being indeed very similar in form to the "Ajax," though rather less full in run. The defective steering of vessels of the type in question, and especially the tendency to require some helm on a straight course, the direction of such helm not being always the same, has been sometimes and plausibly attributed to the fact that while there is little in the shape of hull of such vessels to control them in a straight course, and counteract the tendency of wind or other accidental causes to divert them from it, the controlling effect of the rudder itself is presumably weak, in virtue of its position in the dead-water behind the full run. Moreover, it seems a very reasonable surmise that in twin-screw ships the suction of the screws may tend to enhance the deadness of the dead-water region intervening between their races, so as to make the rudder almost powerless unless put over to an angle large enough to bring its after-edge well into the wash of the screw on one side or the other.

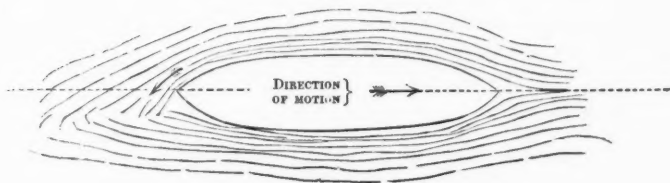
When, however, I came to consider the accounts which were given of the behaviour of the "Ajax," the hypotheses just referred to did not seem to me, if taken alone, to account entirely for the recorded phenomena. In particular, the occasionally prolonged persistency of the direction of the helm—sometimes lasting unchanged for hours in spite of great changes of course of ship meanwhile—and the remarkable suddenness and violence with which the ship was reported to have sprung off her course when the helm tendency eventually reversed itself, appeared to me to point to some cause tending strongly to throw the ship off a straight course, rather than to a mere weakness of the forces tending to keep her on it. This surmise fell in with a phenomenon which had been incidentally noticed some years previously in the course of the experiments on the resistance of models then conducted by my father, the late Mr. W. Froude, in the experiment tank at Torquay. I refer to some experiments on the model of the "Northampton," a ship which I have already mentioned as having in her steam trials shown steering tendencies somewhat resembling those of the "Ajax."

In these resistance experiments, the models were towed from a carriage running on a railway, at the speed chosen for experiment, the models being held rigorously in the line of motion by guiding attachments at each end. In the case of the "Northampton" model (the only model in which the phenomenon was tested), it was rather surprising to find that, although as just hinted the model was towed exactly in the direction of its centre line, and the water and air were both perfectly free from either currents or wind (the tank being under cover), the model steadily exerted a considerable lateral force against the stern guiding attachment, sometimes to port, and sometimes to starboard, throughout each experiment, and occasionally reversing its direction free from an experiment. In fact, had this model been steered by a rudder, however effectively placed, (instead of being guided by the mechanical attach-

ment I have mentioned), it is evident that to keep her on a straight course would have demanded a decided helm angle, sometimes persistently on one side, sometimes on the other, and occasionally changing from one side to the other, just as was actually experienced in the "Ajax."

At the same time, it was observed, in the model experiments to which I refer, that whenever the lateral force was operating (which in the "Northampton" model was not always), the wake, instead of trailing symmetrically astern in the centre line, trailed on one side, as is indicated in Fig. 1, with a transverse flow across the stern as indicated by the arrow; the side on which the wake so trailed, and towards which the water flowed, being the opposite of that towards which the stern was exerting its force against the guiding attachment. It may be observed that this one-sided wake, and trans-

FIG. 1.



verse flow across the stern, is the kind of effect which would have been caused in the water, had the model been provided with a rudder with the helm over in the direction in which it would produce the observed lateral force, and it is, therefore, not surprising that the model should experience much the same force as if such a rudder had existed. But, however this may be, it was a natural inference that the observed lateral force consisted in effect of a one-sided or unbalanced water pressure, involved in the one-sided system of flow of the water closing in behind the model. The fact that this one-sidedness of flow was not always in the same direction, showed that it arose not from any lopsidedness of the hull, but from some tendency of the water, in closing in behind the form of hull in question, to accept and maintain a system of flow one-sided in one direction or the other, the choice between the two directions being matter of accident.

It seems at first sight a rather paradoxical supposition that the flow of water past a symmetrical body should evince a determined non-symmetry, and I imagine that no such phenomenon can occur if the leaving lines or "run" of the body be sufficiently sharp. If, however, they are so blunt as to engender an eddy or large mass of dead-water, it seems that the flow is sure to be more or less one-sided. In the case of the "Northampton" model here referred to, it appeared that the degree of bluntness was just such as to admit of either a symmetrical or a one-sided flow. In the "Ajax" model, however, it



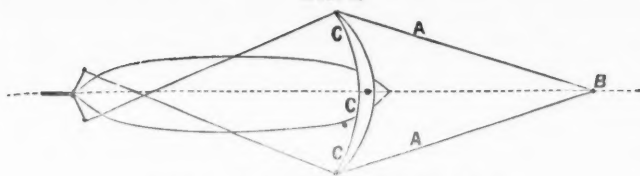
appeared from the experiments which I will presently describe, that not only was the one-sidedness of flow very much more marked than in the "Northampton" model, but the symmetrical condition of flow was unable to subsist at all.

I may here remark (although the circumstance did not come to my knowledge until the experiments on the "Ajax" model had been some time in progress) that this determined one-sidedness of the wake appears to have been observed by Captain Kennedy in the course of the trials of the ship, and was recognized by him as a possible cause of the tendency to carry helm. In a report, dated 28th July, 1885, Captain Kennedy, referring to the occasional sudden change of helm tendency from one side to the other, says: "My belief is that on such occasions a huge body of water changes from one quarter to the other, and affixes itself there like a clam. From that moment the helm is carried the reverse way to what it was before."

When I first undertook the investigation of the case of the "Ajax," I had not the advantage either of these observations by Captain Kennedy, nor of my own independent observations of the behaviour of the model of the ship; but it will be readily understood that the previous experience with the "Northampton" model, to which I have alluded, sufficed to suggest to me that at any rate one principal cause of the defective steering of the "Ajax" was probably to be found in the lateral force on the stern, due to the determined one-sidedness of flow caused by the full run of the ship. At the same time, it seemed likely that the magnitude of the evil might be partly due also to weakness of the action of the rudder, owing to its position in the dead-water. In fact, it was uncertain how much of the ill effect was due to the potency of the disturbing cause, and how much to the weakness of the means of resisting it; it needed, therefore, to direct the investigation so as to test the effect of expedients designed to remove or mitigate either or both of these supposed harmful conditions. The readiest way of doing this, with the means at my command, appeared to be to make a model of the ship, and tow it in the experiment tank from the experiment carriage ordinarily used for measuring the resistance of models, the model being, however, controlled in a straight course, not as usual by the mechanical guiding attachments already alluded to; but by a working rudder similarly placed and shaped to that of the ship.

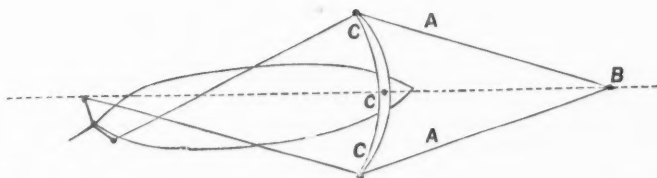
The arrangement which I finally adopted for effecting this, is indicated in skeleton plan in Figs. 2, 3, and 4. The bridle AB A was attached to the towing carriage at B, and to the ends of the spreader CCC, which pivoted on the model at the point C. The ends of this spreader were connected by crossed yoke-lines with a yoke in the rudder-head. Fig. 2 shows the model pointed truly in the line of motion, and the rudder amidships. In Fig. 3 the model is shown pointing to port of the line of motion, and in this position it will be seen that the effect of the arrangement of bridle and yoke-lines is to put the helm hard-a-port; a contrary deviation of the model would in the same way cause a contrary helm, so that any attempted sheering

FIG. 2.



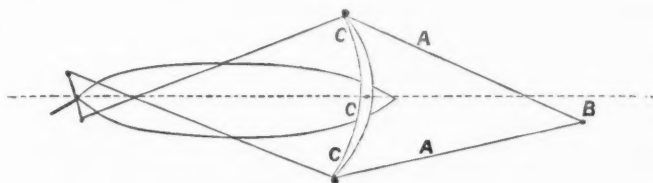
Model towing straight with helm amidships.

FIG. 3.



Model sheering to port with helm apart.

FIG. 4.



Model towing straight with steady port helm.

of the model in either direction necessarily puts the helm over in the right direction for frustrating the attempt. At the same time, since the angle of helm depends not directly on the angle of the model with the straight course, but on the angle of the spreader with a line square to the model, it is possible, as is shown in Fig. 4, for the helm to stand at an angle without the model pointing off her course. This is, of course, an essential provision in an arrangement intended to steer a model of a ship such as the "Ajax," which requires a considerable permanent helm angle in one direction to keep her on a straight course.

The effect of this arrangement was to make the model steer a very straight course in all the conditions of trial; and the criterion

of the steering qualities lay in the amount of the angle of helm and the degree of its unsteadiness, as evidenced by a diagram recorded by an automatic apparatus mounted in the model which continuously registered the helm angle throughout every experiment. Specimens of these diagrams are shown in Figs. 5 to 9, to which I will presently refer in more detail.

In Figs. 2, 3, and 4 I have for the sake of distinctness greatly exaggerated the length of the yoke on the rudder-head. It is worthy of remark that to make the model steer well it was found necessary to have the spreader some ten times the length of the yoke, so that a small angle of spreader should entail a relatively very large angle of rudder. Otherwise the model was apt to steer a determined serpentine course.

Apart from the absence of screw propellers in the model, to which I will refer presently, the model towed by the carriage and steered automatically in the manner I have described, failed in one other respect to represent strictly the ship propelled by her own screws and steered by a rudder worked from on board.

To maintain the rudder at an angle of helm requires of course a difference of tension in the two yoke-lines, and therefore also—since the spreader to which they were attached was free to pivot—a difference of tension in the two parts of the bridle. Supposing for a moment that this difference of tension of the yoke-lines was such as to slacken one part of the bridle altogether, the model would be in effect towing by the other part only, and would be then subject to a turning moment or couple due to the forward component of the tension acting at the end of the spreader, added to the lateral component of the tension acting at the pivoting point of the spreader, which in this arrangement was close to the bow of the model. This, although an extreme supposition, suffices as an illustration to show that even the mere difference in the tension of the two parts of the bridle, which as a fact must have subsisted, being an approach towards this condition, must have involved in a less degree a turning moment of the same kind. It is easy to see that this turning moment is in the same direction as that due to the rudder, and that its existence must therefore tend to diminish the helm angle necessary for keeping the model on her course; but it was not easy by theory to calculate with confidence the degree to which an experiment conducted on this system underrated the required helm angle; I therefore arranged an experiment to afford some information on this point.

The expedient I adopted with this view was to substitute for the crossed yoke-lines attached to the ends of the spreader, yoke-lines led through eyes in the deck of the model, and thence vertically to a point in the towing carriage where they could be worked by hand. The lines being purely vertical, their tension could only produce an (insignificant) lifting force on the model, and differences in their tension could produce no turning moment of any kind on the model. Steering the model by hand in this manner, I made experiments in one of the conditions of trial of model in which the required helm angle (and, therefore, presumably also the required difference of ten-

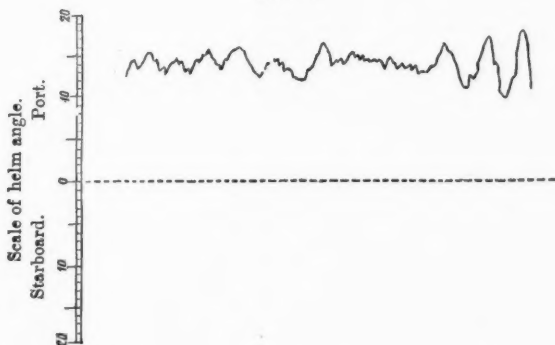
sion of the lines) was found to be greatest, the actual helm angle administered being recorded throughout each experiment by the recording apparatus in just the same way as when the model was steered automatically.

An instructive evidence of the extent to which the practical effect of the bad steering qualities of the ship might be expected to depend upon the degree of skill and experience of the helmsmen, was incidentally afforded by the difficulty that was found in steering the model satisfactorily by hand, although, as already mentioned, the result was unfailingly achieved by the automatic arrangement. Even after some practice, I was only now and then able to approach the steadiness with which the model was steered automatically; still I obtained sufficient results to make it clear that the helm angle was not very materially underrated by the automatic arrangement.

Having thus found in the automatic steering apparatus a presumably satisfactory test of the steering qualities of the model, I wished in the first place to ascertain whether the behaviour of the model, as tested by this apparatus, agreed fairly well with the reported behaviour of the ship, and with this view I tried the model of the ship as she stood, with rudder fitted precisely as in the ship, both at her load draft and trim, and at two other fore and aft trims, viz., one by the head and the other by the stern, with results which may be broadly stated as follows:—

The model duly showed the phenomenon of a large helm angle carried persistently on one side, as in the diagrams shown in Figs. 5 and 6.

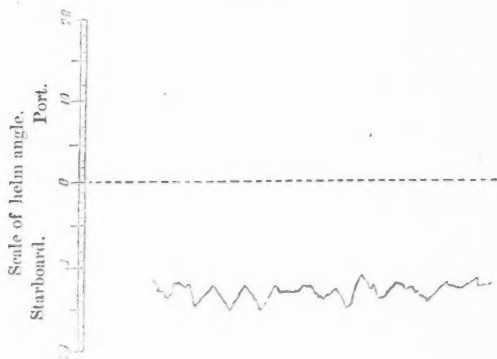
FIG. 5.



The helm was generally port helm, as in Fig. 5, but was occasionally starboard helm, as in Fig. 6. It seems probable that there was some non-symmetry of the model which, though too slight to be perceived, sufficed to generally decide the flow of water in the direction which caused port helm. Such non-symmetry, however, if it existed, did

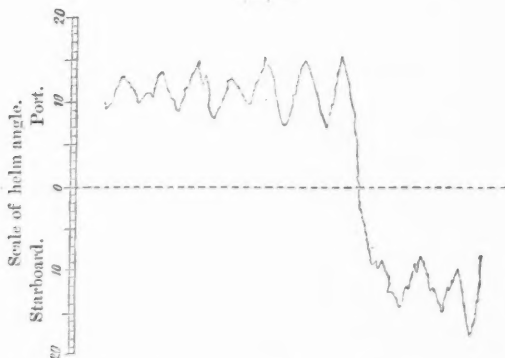
not prevent the subsistence of the conditions causing starboard helm, when once initiated, as is evidenced by the diagram in Fig. 6.

FIG. 6.



Occasionally the helm changed sides during a run, as appears in Fig. 7. (This continually happened in the condition of trim by the head.)

FIG. 7.



The helm angle in the model was rather less than was reported in the ship, being at the outside  $15^\circ$  instead of nearly  $18^\circ$ . This difference, however, might imaginably be accounted for by the absence of the screws in the model, and also perhaps partly by the turning moment due to the bridle already referred to.

Thus, all things considered, the reproduction of the behaviour of the ship in the model appeared to be so far quite sufficiently exact. There was, however, one characteristic of the model performance which appeared at first sight inconsistent with what I had learnt concerning the reports of the behaviour of the ship.

I understood that the "Agamemnon," at any rate, had been found to steer best when trimmed most by the stern. But in the model the helm angle proved greatest when the model was trimmed by the stern, and least when she was trimmed by the head. On the other hand, with the trim by the stern the helm angle was most steady and least apt to change sides, and presumably when the ship was said to steer better if trimmed by the stern, it was meant that for practical purposes this superior steadiness of helm angle was an advantage outweighing the evil of its greater amount. In a subsequent conversation with Captain Kennedy, I gathered that this was in accordance with his experience of the "Ajax."

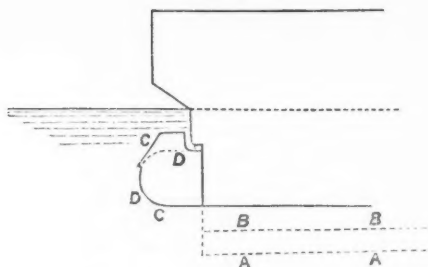
On the whole, then, the results so far obtained seemed to me to warrant considerable confidence in the conclusions which might be deduced from experiments made with the apparatus and in the method that I had employed; in spite of the fact that the effect of the screw propellers in the ship was unrepresented in the model. To have introduced working propellers in the model would have been costly, and probably very difficult to effect in a manner satisfactory for the purpose; I therefore determined not to delay the investigation by any attempt of this kind, but to proceed at once with the apparatus as it stood, to try the effect of introducing various remedial expedients in the model. I considered that such experiments might, at any rate, be relied upon to indicate the nature of the remedial expedients that would be most effective in the ship; even though (in consequence of the absence of the propellers in the model) they possibly might not enable us to predict quantitatively with perfect confidence the exact amount of change (in the helm angle for instance) that would follow any given modification of ship or rudder.

When, in default of means or opportunity of making model experiments, it may be necessary to make experimental modifications in an actual ship, the cost of the required alterations, and the time occupied in making them, together with the chance that the remedy may prove to introduce worse evils in one way than it cures in another, enjoin that we should begin tentatively by trying at first rather slight modifications. In experiments upon models the wisest course is generally the opposite of this, and therefore in this investigation I preferred to begin with rather exaggerated expedients, such even as it might be practically quite impossible to apply in the actual ship, with a view of determining at the outset in what direction improvement was to be sought. I afterwards tried some presumably practicable expedients of what had proved the most promising kind. Of the whole series of expedients thus subjected to trial, the more important ones will be found in Figs. 9, 10, and 11, shown in profile.

The exaggerated expedients, as I have termed them, which were dealt with in the preliminary portion of the series of experiments,

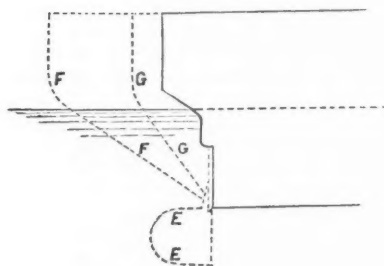


FIG. 9.



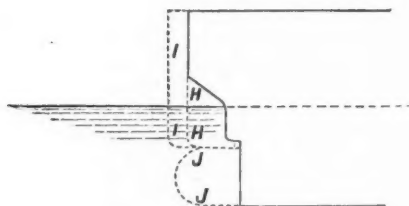
- AA 12-foot keel.  
 BB 6-foot keel.  
 CC Rudder of ship as fitted before recent alterations.  
 DD Original shape of rudder (also tried in model).

FIG. 10.



- EE Rudder placed below keel.  
 FF 36-foot deadwood.  
 GG 18-foot deadwood.

FIG. 11.



- HH } Practicable deadwoods.  
 JJ } Rudder as used with these deadwoods.

were selected as being severally designed to remove or mitigate the principal different causes to which the defective steering might be colourably attributed. I have made some allusion to these in the earlier portions of this paper: they may be classified here as follows:—(1.) Want of directive character (if I may use such a phrase) of hull of ship from flatness of bottom and fulness of ends. (2.) Weakness of action of rudder from its position in the dead-water. (3.) The presence of an active turning force in the shape of lateral pressure on the stern, arising out of the one-sided flow of the water closing in behind the full run.

To remedy the first-mentioned defect, the model was fitted with keels of various depths at the stern-post, and tapering to nothing at the bow. The beneficial effect of these was very partial, the helm angle being reduced by barely one-half, even by the 12-foot keel. This result showed that what I have termed the "want of directive character" of the hull was at any rate not the principal element of defect, and made it clear that no practically admissible keel could prove a satisfactory remedy.

My experimental remedy for the weakness of action of the rudder owing to its position in the dead-water, was to place it altogether below the line of keel of the vessel (see Fig. 10). This change did not appreciably diminish the helm angle, a result which, at first sight, implies that the action of the rudder in its usual position had been in no degree impaired by the dead-water. For reasons which will presently appear, such an inference is scarcely justified; but it was clear, at any rate, that the main cause of the bad steering was other than the position of the rudder in the dead-water.

As a remedy for the presumed lateral force on the stern, due to one-sided flow of the water, I tried a triangular plane or deadwood (a fixed rudder in fact) extending at the water-line level 36 feet (to scale) astern of the stern-post (again see Fig. 10). This appendage could, at any rate, hardly fail to intercept the transverse flow across the stern, to which I have referred in the earlier part of this paper, and it appeared calculated to dismiss the flow from the two sides of the ship, symmetrically in parallel streams on each side of the centre line. The effect of this expedient on the steering proved to be an almost perfect cure. The angle of helm was reduced to  $1^{\circ}$  or  $2^{\circ}$  (an apparent helm angle small enough to be attributable to error in the apparatus) and was, moreover, extremely steady, see diagram, Fig. 8. There could,

FIG. 8.



therefore, be no question that the one-sided flow at the stern was the main source of the evil, and that it was curable by means of some such appendage as this deadwood, if it should prove practicable to apply the expedient on a sufficient scale.

In the trials with this triangular deadwood, the working rudder was of course placed below the keel-line, as already described; indeed it was partly as a preliminary step towards the trial of this deadwood that the trial of the rudder in this position had been introduced. It may be here noticed that the result of the deadwood experiment to some extent discounts the inference to which I have referred as deducible at first sight from the rudder experiment, namely, that the action of the rudder in its natural position was in no way impaired by the dead-water. In its natural position the rudder must have been to some slight extent performing the function of the deadwood, a beneficial function which must have been sacrificed by the removal of the rudder to the lower position. Since, then, the helm angle was at any rate not largely *increased* by the change of position of rudder, it is to be presumed that the sacrifice must have been counterbalanced by a concomitant gain in strength of action of rudder through its being brought out of the dead-water. This supposition seems corroborated by the fact that the removal of the rudder to below the keel, while not materially changing the amount of the helm angle, rendered it generally more steady, thus implying that a less angle of rudder sufficed to produce a given effect.

The curative effect of the 36-feet deadwood having been found to be so marked, a similar deadwood only 18 feet long was tried (again see Fig. 10), likewise with good results, the helm angle being apparently little greater than with the 36-feet deadwood; the helm, however, was rather less steady.

Subsequently, as a practicable expedient of the kind, there was tried a deadwood, carried out above the level of the rudder in its original position as far as the plumb of the taffrail; also a similar deadwood prolonged 5 feet further sternwards. Neither of these arrangements gave so good a result as either of the triangular deadwoods, the helm angle being much more unsteady; still, the result was a great improvement on the original condition of trial, the average helm angle being reduced from the  $15^{\circ}$  of the unaltered model to  $5^{\circ}$  or  $6^{\circ}$  with the shorter deadwood, and still further reduced with the 5-feet additional length. It seemed uncertain how much difficulty in steering would in practice arise from the variations in helm angle, which indeed appeared to have been rather increased by the alteration; but the specially dangerous feature of a large helm angle liable to occasional and unexpected reversals of direction was evidently cured; and, short of a very costly (and perhaps, for other reasons, undesirable) reconstruction of the stern so as to bring the whole stern-post and rudder further aft, the arrangement in question appeared the only practicable device that could achieve this object.

On the strength of the results of these experiments the Admiralty added to the stern of the "Ajax" a structure very similar to the

longer of the two deadwoods just referred to. That the alteration has been on the whole very beneficial appears from Captain Durrant's Reports on the behaviour of the ship, from which I am permitted to quote.

In a Report, dated Portland, 15th June, 1886, Captain Durrant states as follows:—

"I have the honour to report that the alteration recently made to the stern of H.M.S. 'Ajax' has had a very beneficial effect on her steering.

"On the passage from Chatham to Portland, with a view to testing this, the engines were worked at full power for six hours, realizing a speed of a little over 13 knots.

"The ship still carried starboard helm, but only from  $\frac{1}{2}$  to 1 turn, instead of from 2 to  $2\frac{1}{2}$  as was formerly the case, and she did not show any tendency to suddenly 'come to' against the helm, and rush off at right angles to her course as previously reported.

"She answers her helm readily, but requires rather more of it than most ships . . . . Altogether, I am of opinion that the alteration has been a decided success, though the ship even now does not steer as well as most ships do; and the fact of her always requiring an uncertain amount (as it is never quite the same) of starboard helm makes it very difficult to steer an absolutely straight course by the compass, and this would be an element of danger in a fog with a fleet.

"I am in hopes, however, with further experience and practice, this difficulty may to a certain extent be lessened."

In a subsequent Report, dated Vigo, 9th July, Captain Durrant further says—

" . . . . I have the honour to report that since the alteration made in her stern, she steers fairly well at full speed with smooth water and on a steady course, requiring from  $3^{\circ}$  to  $7^{\circ}$  of starboard or port helm (but whether starboard or port is never certain at starting); she readily answers any larger amount of helm, turns quickly, and steadies fairly well.

"At lower rates of speed, varying from 4 to 8 knots, she does not steer nearly so well, carrying from  $7^{\circ}$  to  $9^{\circ}$  of helm, and is generally about half a point on one side or other of her course, and when it is necessary to make frequent alterations of course, as in manœuvring, she is very difficult to handle."

From these Reports it is evident that the result of the investigation, while highly successful from a practical point of view, so far at least as the behaviour of the ship at high speeds is concerned, affords also a satisfactory corroboration of the model experiments. Unfortunately time did not permit of pursuing the model experiments through a series of different speeds, or presumably we might have been thereby prepared for the inferior behaviour of the ship at low speeds. So far as I can gather, the Reports on the performance of the ship do not afford any strict comparison between the behaviour at low speeds before and after the alteration, but it is clear that at these speeds the effect of the alteration, if an improvement at all, is but a slight one.

From the figures for the low-speed helm angle given by Captain Durrant ( $7^{\circ}$  to  $9^{\circ}$ ), I am inclined to think that the alteration must have effected a small reduction in the average helm angle; but it is quite possible that the increased unsteadiness of the angle which in the model (at the high speeds at least) was observed to follow from the alteration, may have practically outweighed the benefit of the reduction in its average amount.

If this surmise is correct, and the chief remaining evil arises from unsteadiness of helm angle, it is one which may perhaps be satisfactorily met by expedients designed to improve the effectiveness of the rudder. As has been already stated, placing the rudder below the dead-water region was found to diminish the unsteadiness of the helm angle, though not its amount. Possibly, then, a widening of the rudder (as is suggested by Captain Durrant in one of his Reports), or the addition of "Joessel" side-plates, may do a great deal to remedy what defect remains. I have little doubt that any alteration equivalent in effect to what I have termed the "36-feet deadwood," would be found a practically perfect cure at all speeds; but this could not be done without an entire reconstruction of the stern. In fact, except by such a reconstruction, it seems hardly practicable to proceed in this direction any further than in the modification which has already been made.

Admiral SIR J. E. COMMERELL: I should like, Sir, to hear Mr. Froude's description of what he calls the "Joessel side-plates." Are they the same side-plates as those put on the auxiliary rudders of the corvettes? Does Mr. Froude consider that the erratic steering of the "Ajax" may be mainly attributable to the coarseness of her run? He can hardly, I suppose, consider that it would be due to the form of the rudder, because the model which he has experimented on, if I understand rightly, had always the same form of rudder. Therefore, as I understand, he made no experiments whatever to see whether the form of the rudder had anything to do with it.

Captain CURTIS: I think Mr. Froude has told us the reason of the bad steering of the "Ajax;" it is because the water had not full or sufficient access to the rudder. If you look at that model of the water run, and put a straight edge on the side of it, you will find that the water would go far astern of the ship's buttocks, and she would be always dragging dead water. I should like to know the breadth of the tank in which the experiments were tried, because the reflux of the wave from the vessel passing through the water would act in a measure on that vessel. We know that vessels have been sent abroad, the "Erebus" and "Terror," for instance, "floating batteries" with what they called a rudder amidships, but it had no effect on the ship, and the Captains had to put quarter rudders. I maintain there is no similarity between a steam ship and a sailing ship regarding the steerage. A sailing ship gets a flow of water to the rudder. I think it is through the want of a sufficiently fine run the bad steering is caused.<sup>1</sup> The ship which towed over the Cleopatra Needle vessel had great difficulty with her in towing, as she was simply a tube tapered sharply at each end. The pressure on the end and side caused the Needle vessel to sheer, and no amount of her rudder pressure could get her end on, she towed with a sheer on the vessel's quarter. I used to know the late Mr. Robert

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<sup>1</sup> No allusion in the discussion or lecture was made with reference to the ram; the water striking the angle of bow or ram would cause the vessel to sheer, and no doubt the addition of deadwood, added to the stern, tends to remedy this defect by counteraction at the stem.

Griffiths, and talked to him a good deal about these matters, and he said that for a steam vessel the upper half of the rudder is quite sufficient, as he knew a case in which a vessel lost the lower half, and she steered just as well with the upper half. Twin screws certainly should have a rudder to each screw, but the tendency now is to reduce the screws and get greater velocity; the result is the water will act better on the rudder, that is, the in-flowing water on the upper half, and thrust from screw on the lower half. I believe the shape of a vessel for steering and manœuvring should be the half of a prolonged ovoid at the water-line, the greatest diameter being about two-fifths from the bow; that would always keep the vessel pointed right, and she would answer her helm. If she were a sailing vessel, that would be so, but in the case of a screw the water must come in to follow the ship, and thrust of screw should be seen to for steerage. There is a vessel which shows that the screw is actually drawing water away from the ship,<sup>1</sup> circulating the water round, and drawing it from the condenser jacket through an aperture in the stern, showing what action the screw has on the in-flowing water. The thrust from the screws on the rudders of duplex would no doubt steer these ships "Ajax" and "Agamemnon."<sup>2</sup>

Admiral SIR J. E. COMMEREILL: I do not know whether the last speaker is aware that the plan of having a rudder to each screw was tried in the "Sultan," and found a complete failure. The rudder to each screw which came out in the form of a shutter did not alter the vessel's course half a point.

Captain FITZGERALD: I have listened with great interest to Mr. Froude's paper, and although I do not think the models give you actually what occurs in a full-sized ship, still I think these experiments may be attended with very useful results. I see that all his observations have been directed to correcting this, what we might call, aberration of the steering of the "Ajax." Mr. Froude has mentioned the "fulness of run." I am inclined to think I should look to the other end of the ship altogether—to the "fulness of bow," not the fulness of stern. We all know you may tow a bad model at a certain speed with fair success, a spar, for instance, with a bluff end, and up to a certain speed it will tow well. If, however, you increase the speed it performs all sorts of erratic manœuvres and develops the tendency the "Ajax" seems to have developed, which, in fact, is nothing else than a tendency to go sideways. I should put it down entirely to fulness of the general lines of the ship; I think that the model is not a model which could be expected to go more than about 10 knots. If I am correct in this idea, it would seem to explode the theory that you can build a very broad ship, and, by putting in horse-power, drive her at high speeds. I never believed that. When you put armour on a ship and heavy guns, you cannot have a shallow ship; she must sink into the water to float the heavy weight, and I never believed that you could get speed out of a short broad ship deeply weighted. The "Ajax" seems to have been a vessel intended to go at about 10 knots. You then add horse-power to drive her 13 knots, the result being that she begins to develop this extraordinary tendency to go sideways. Mr. Froude attributes this aberration to three causes—first, "the want of directive character of the hull of the ship, from flatness of bottom and fulness of ends." I quite agree in the definition "directive character," it is a very clear one; I attach

<sup>1</sup> Vessel belonging to the Trinity Board.

<sup>2</sup> Quoting "Ship Building, Navigation, &c.," by the author of "A Year in Spain." Pub. 1834. "Among the admitted and well-established principles of construction, is the leading one that the greatest breadth must always be before the centre, and consequently the bow be more blunt than the stern. Some of our best builders place this point only one-third of the length from the stern. Abstractly, it would seem most important that the bow should be adapted to divide the water with the least possible resistance: *but experience has proved that it is far more essential to facilitate the escape of the displaced water along the side of the vessel; for when once a passage is opened for the ship, the fluid tends to reunite abaft the point of the greatest breadth, where instead of offering resistance, it presses the ship forward in its endeavour to recover its level and fill the vacuum constantly opening behind her.*" Sir Isaac Newton demonstrated the mathematical proof of this principle.



very much value to fineness of ends. If you put fine ends you can abolish dead-wood altogether, and yet the ship will steer. The second reason he gives is the weakness of rudder action from its position in the dead water. He has proved in a very clear manner that that does not seem to be an appreciable cause, because when he put the rudder right down below the vessel in perfectly clear water he improved the steering very little. His third reason is "The presence of an active turning force in the shape of lateral pressure on the stern, arising out of the one-sided flow of water closing in behind the full run." This is a point on which I have to differ. I should say it was lateral pressure on the bow, and not on the stern at all. The pressure on the stern is only the result. The vessel has been forced too fast through the water, she has developed a tendency to turn broadside on, and I have no doubt if you had sufficiently accurate instruments for measuring when the pile of water was found on the quarter, a similar pile of water would be found on the port bow in Fig. 1, and the pressure there would be very much greater than on the stern. I would urge Mr. Froude in his experiments, if he intends to carry them on, to invent some instrument to find that out, because I believe the bow is the place to look to and not the stern. The water is piled up on the quarter by reason of the ship endeavouring to make a crab-like motion, caused by the fullness of bow. I should like to know whether the ship when she was carrying her great angle of helm developed a list, for this would help us very much in finding out whether my view is correct that the bow is the place to look at, and not the stern. I should also imagine that Mr. Froude might make an instrument—I do not quite know the nature of his model, but I think it could be done in the ship herself—to find out what course she is making when she is carrying, we will say,  $18^{\circ}$  of starboard helm—Fig. 1 represents the course. I have a very strong idea that she is not going in the line of the keel at all, she is not following the direct line of the ship, because I cannot make out how that pile of water that they speak of on the quarter could get there if she was going straight. I believe they have taken the effect for the cause, and I think she is going sideways. This point might be cleared up, and if that is the true theory, the only conclusion one can come to is that this bluff-bowed ship was not intended to go at 13 knots, and that the more power that is put into her the more you will only drive her under water or sideways. It seems to me the only way to remedy this is to lengthen the bow and not the stern, because you will then get more speed, and I believe you will also get accurate steering power without increasing the draught of water.

Rear-Admiral COLOMB: Sir, I think that this is one of the most difficult papers to discuss that we have ever had in this Institution. The language is so accurate, the thoughts that that language covers are so accurate, that I have found it difficult to follow the precise line and not to miss the points which the lecturer has put forward. He has mentioned the case of the "Inflexible." I happened to have the trying of the "Inflexible" at her full speed, and what was noticed was this: it was, I won't say very remarkable, but it was somewhat remarkable to see the tendency that she had to carry either helm, and to stick to it for a time. When I commissioned the "Audacious" and left England we were for three or four weeks in great trouble about the tendency of the ship to carry first port helm and then starboard helm. We laid down a number of accurate regulations as to the revolutions of the screw and a variety of matters of that sort, but we found when we came to know the ship, that many of these difficulties passed away. So far as I understand that is commonly found in ships which start on their first commission as to difficulties of steering. I do not mean to say that those difficulties pass away altogether, but they become to some extent minimized, and I have no doubt but that in the case of the ship we are now discussing, the difficulties from the mere knowledge of the character of the ship are not quite so great as they at first appeared, though no doubt they are and were bad enough. I recollect having to investigate the case of the "Frolic," which came to Portsmouth in her second commission with a tendency not quite the same, but still a good deal the same, that is to say, she required a great deal of starboard helm to keep her on her course. We got her into dock, examined her carefully, and, as far as I recollect, there was nothing in the structure, there was nothing in the rudder, nothing in anything we could discover, to show the cause of this idiosyncrasy

on her part. I suggested, and it was afterwards carried out, that we should accurately measure the manœuvring powers of the ship, and what we found was that there was a most remarkable weakness of rudder power, that is to say, although there was nothing on the face of it to indicate the cause, the little "Frolic," a 600-ton ship, took about the same space to turn in that the "Dreadnought" did, and there was no curing it. It struck me that what was happening was this, that from want of symmetry in the form or some difference in the pitch of the screws there was a very slight tendency to carry starboard helm, which would have been corrected in an ordinary ship where the rudder had sufficient power with a very small helm, but it was not corrected in this ship until a very large helm had been used, and it became observable. I quite follow Captain Fitzgerald as to the point he made, which I think is a very good one, in Fig. 1. I am not quite clear upon the lecturer's words, whether that flow of water is cause or effect; in fact, it seems to me it must be admitted that it is not cause. If there is a flow of water in the direction of the arrow there must be corresponding pressure on the quarter of the ship, and therefore it seems to me Captain Fitzgerald must be right so far, that the flow of water is caused by the fact that the ship is not passing over the course that she is apparently steering, that she has, in fact, a certain amount of leeway. That would not be discovered, as far as I can understand, at the moment, nor until astronomical observations fixed positions periodically. Whether that has been looked for and so ascertained I do not know. As to the want of directive character in the ship; I have been a little surprised from my own experiments with regard to Fig. 9, an addition to the directive character of the ship in the form of a keel—I understand that keel was tapered to nothing towards the bows—I am surprised to find that that did not seem to have the desired effect; I should quite have expected it.

Mr. FROUDE: It halved the angle.

Admiral COLOMB: I had missed that; I should have expected that it would have that effect, because I cannot help agreeing with Mr. White, who put it so well, in saying that a ship in proceeding under the action of engines is in "unstable equilibrium," and that a very little thing will upset that equilibrium. It appeared to me that the "unstable equilibrium" in which the "Ajax" proceeds found its balance on either side when under the action of the rudder. The action of the rudder and the pressure of the water had balanced it and kept the ship on its balance, and the instability of the equilibrium was then destroyed. If I am wrong in the supposition that the flow of water is effect and not cause, then I must admit that Figs. 10 and 11 have corrected it in the way that it is supposed to be corrected, namely, by preventing that flow; but I have to point out that I think that increase of deadwood is not only stopping a presumed flow of water there, but it is also increasing, just as the keel below in Fig. 9 increases, the directive character of the ship. I am not quite clear that the want of directive character is not the whole difficulty in the ship, and that while we suppose we have been preventing the flow of water we have been really increasing the directive character; because you must recollect that as that deadwood is abaft the sternpost its directive character must be much more efficient than that which is before the sternpost. In Mr. White's vessels, which were spoken of, with no deadwood, the directive character of this kind is certainly wanting, but the rudders are very large, and the flow of water from the absence of deadwood to the rudders is very free. Those boats, so far as my experience goes, require watching. Unless the helm is carefully watched I do not think their course is maintained with great accuracy; but when watched a very slight touch of the helm is sufficient to correct any tendency to go out of the equilibrium. I cannot sit down without thanking the lecturer for the very excellent, careful, and accurate way in which he has brought this question before us. I am sure we shall all benefit by it quite beyond the mere question of the "Ajax's" steering power.

Mr. W. H. WHITE: I do not like to let this discussion close without saying a word or two, and in doing so I might at the outset say that this experimental investigation into the steering of the "Ajax" adds another confirmation of the high estimate that has been formed of what the Service owes to the work of Mr. Froude's father and to Mr. Froude himself. With the design of the "Ajax" and "Agamemnon" I had nothing whatever to do, but as to the steering I have very

painful personal experience, having attended many trials with both ships. No doubt the steering was originally defective. The question which has been raised in the discussion whether it is desirable or not to attempt to combine a very limited length and draught with high speed and heavy armour is really beside the purpose of the present paper. The position in which those who came in at the end of the story found themselves was this: here were two powerful ships in the Navy, they had in them the possibilities of good speed, powerful armaments, and thick armour; but they had the great vice of uncertain steering—a serious fault, whether it be considered in relation to the performance of the ship alone or to her performance in company with other ships. Passing by all intervening steps, and taking things as they now are, the facts are briefly as follows:—Admiral Baird, when he took command of the squadron in 1886, told me that he would prefer, from past experience, to put the "Ajax" as the leading ship of the line, where she could not do any mischief; but when he came back he said he should be quite prepared to put her anywhere in the squadron, and would do so with perfect safety.

Captain FITZGERALD: What speed was he going at?

Mr. WHITE: He was speaking of all the speeds at which the squadron worked. Mr. Froude has not quoted from Admiral Baird's reports, but the general conclusion which Admiral Baird came to is more than confirmed by Captain Durrant's report. The alteration made in the stern of "Ajax" was such as to make her a ship well under control that could be trusted in a squadron. I think that is a fact well worth having established, and that we owe a great debt to Mr. Froude for having suggested the means of arriving at this result in a comparatively simple and inexpensive way. It is true that Captain Durrant reports that at low rates of speed, varying from 4 to 8 knots, the ship is still somewhat unsteady in her course. I think when everything is done that can be done with the "Ajax" and "Agamemnon" at these low speeds without any keels they will be unsteady. They have been termed "skimming dishes," flat on the floor, blunt at the ends, and therefore very easy indeed to turn from a course. But the main thing I would again remark is that the alteration of the stem has made the "Ajax" capable of taking her place in a fleet, and doing her work there. Captain Durrant's words are these:—"I have the honour to report that since the alteration made in her stern she steers fairly well at full speed with smooth water and on a steady course, requiring from 3° to 7° of starboard or port helm (but whether starboard or port is never certain at starting); she readily answers any larger amount of helm, turns quickly, and steadies fairly well. At lower rates of speed, varying from 4 to 8 knots, she does not steer nearly so well." Bad steering now only occurs at low speeds, below the ordinary working speeds; and that is the fact I think we must remember as being the conclusion of this investigation. As regards possible use of a keel in further improving steerage it will be noted that if the ship had a keel (and I quite agree that it would help in steadying her steerage) it would not entirely cure this trouble of uncertain steerage. Moreover, the addition of a keel would diminish the possibility of the range of employment of the ship, because one feature of the construction in justification of the design was the possibility of her serving in shallow water. The top of the rudder, speaking from memory, is something like 8 feet out of the water, and it is something like 10 or 12 feet broad. There is, therefore, an enormous area of rudder, and it is wholly immersed, but the effect of the rudder is no doubt diminished by considerations which Mr. Froude's experiments could not represent—that it has struts and tubes, &c., external to the ship and affecting the flow of water to the rudder and its turning effect. There is no doubt that with small angles of helm you do not get very much good out of your rudder, and therefore you have to put it over to a larger angle in order to get a perceptible effect. With reference to the suggestion that a further extension of the rudder might be an advantage, there is no doubt that if this rudder were made so as to come at a smaller angle of helm into the race of the screw a more effective steerage would be secured. But when it is noted the strain upon the rudder head is already very large, one may well hesitate before accepting any greater breadth of rudder. The "Joessel" side-plates, to which Mr. Froude refers, represent a system which has been largely adopted; but to get any sensible effect with these "Joessel" plates they must be placed about one-half the breadth of the rudder away from the neigh-

bouring surface, so that to get any good effect from them in "Ajax" the side-plates must be placed 4 feet to 6 feet away from the sides of rudder, which could not be thought of. With less athwartship intervals the water cannot get a free flow through the narrow space between the main plate of the rudder and the "Joessel" plate. One other remark that I might make is this: We remember very well the experiments to which Admiral Commerell alludes in the "Sultan," but she was a single-screw ship, and there the double rudders did more harm than good. They were so placed in relation to the screw that the steering effect was very small. The direct comparison to which Captain Curtis refers is to be seen in the "Penelope," the "Viper," and the "Vixen," which have double deadwoods and double rudders, and the steering of those ships is perfect. The other day, when I was outside the public service, I designed a barge to carry a very powerful crane at the Birkenhead Docks. In that case the trouble was to get steerage without headway because this huge construction had to be manœuvred about in a very narrow space. The whole thing has been done with the greatest ease by giving a double deadwood and two rudders, and now the barge can be turned on its centre. The cases of the "Inflexible," the "Nelson," and "Northampton" are not typical examples of what twin-screw ships can do in the way of steerage, and Admiral Colomb will bear me out in saying that some of the most remarkable results that have been obtained in the way of handiness have been with twin-screw ships.

Captain CURTIS: Mr. White objects to the broad rudder. Could not it be hollowed out? Could not the fore part be hollowed out?

Mr. WHITE: If you have a rudder 12 feet broad in a fore and aft direction you must go out at least 4 or 6 feet from the side of that rudder before you can get much good by putting on the "Joessel" plates.

Captain CURTIS: That deadwood is to balance the bow, otherwise the vessel acts as a knocker. The deadwood balances it.

Admiral BRINE: There are some points in Mr. Froude's paper which have not been quite satisfactorily explained to my mind, and upon which I should like to ask a few questions. The first is with regard to what he calls the one-sided flow of water. I should like to know whether in the various experiments undertaken by him he has come to any conclusion upon the cause of this peculiar movement in the water. It appears to me that it must have some relation to the form of the ship, and I suppose that if he has tried experiments both in the form of bows and sterns and quarters of ships, he must have come to some decision whether that rush of water is caused by some peculiar form of bow, or whether it is owing to great breadth. I should like him to tell us to what he really attributes that one-sided flow of water. Again, I should be glad if he will explain why it is that the "Ajax" steers badly at low speed, because it would appear to show that the breadth of bow of a ship really has no influence on the point. If she steered badly at high speed, one could understand that the breadth of bow was the cause; but if she steers badly at low speed, it is clearly not owing to the shape of the bow. There is another point as regards the movement of a ship in a lateral direction instead of in the direction she is steering. This has been observed lately, and perhaps Mr. Froude will tell us whether he has made any experiments which show why it is, that a ship when the helm is changed, proceeds on the original course for some considerable distance. It is said to be the effect of the inertia carried on in the line of previous direction. The point, however, that I should particularly like to have cleared up is to what cause the one-sided flow of water is attributable.

The CHAIRMAN (Admiral BOYS): If I had had to open the discussion, I might have had some observations to offer, but really all that I could have said has been so ably touched upon by other speakers that there is little left for me to add. There is one point that I should like to say another word about. It was raised by Captain Fitzgerald saying that he believed the cause of the bad steering of the "Ajax" to arise in the bow and not in the stern. I am very much inclined to follow in his wake. I think it is possible that the cause of the wild steering may be found in the list to one side the ship may have at the time.

Captain FITZGERALD: What I said was, that the ship when she was going off her course developed a list; I did not mean that she had an initial list before she started.

The CHAIRMAN: I am speaking of the initial list, that ships are subject to: for instance, the "Monarch" (once commanded by Admiral Commerell), even when anchored at Spithead, was seldom on an even keel. She was generally laying over as much as three or four degrees by the pendulum, and would suddenly change from one side to the other without any apparent cause. We old sailors especially can call to memory how the old bluff-bowed sailing ship when she had the wind on her side and heeled over to it, carried weather helm, and the more she heeled over the more weather helm she carried. I believe, irrespective of the sail effort, that was the effect of the bow and not of the stern; that when the weather bow came out of the water, the lee bow was immersed deeper in the water; the latter acted as a bow rudder, and forced the ship's head up to the wind. The initial list of the ship may be one of the causes of the wild steering of the "Ajax," and perhaps Mr. Froude will give us his opinion. I once heard a Queen's pilot, who was taking some flat-bottomed ships into Portsmouth Harbour, and had some little difficulty in getting alongside the wharf, say, "I can steer a ship, but I cannot steer a butcher's tray." I think that remark was very pertinent. To obtain accurate steering, you must either have length or depth in proportion to bulk; but when you attempt to steer ships like skimming dishes or butcher's trays, you set sailors a problem not to be solved. It is impracticable. Another point I would dwell upon is this. No doubt, with the alterations in the "Ajax," developed from Mr. Froude's experiments, her steering qualities have improved, but the improvement in my opinion results far more from the manner of steering of the ship. After a cruise or two, the Officers, quartermasters, and helmsmen get accustomed to their ships, and ships originally pronounced to be nearly unsteerable are found, after more experience, to improve and steer fairly well. I will now ask Mr. Froude to reply to the questions which have been raised.

Mr. FROUDE: I think Mr. White has been kind enough to answer the questions asked by Sir Edward Commerell and also by Captain Curtis. I may mention in corroboration of what Mr. White said about the "Joessel" side-plates, that they were tried in the model of the "Ajax," and we found that they did not do much good unless they were, as he says, a considerable distance off the rudder. I forget the figures at this moment, but my impression is that to give fairly good results they had to be 4 feet off the rudder. So placed they did improve the steering to some extent. As to the curing of the difficulties of steering by practice, I quite agree that there is a great deal in that, and I gave an illustration of it in this paper in saying how difficult I found it to steer the model by hand, although the automatic apparatus always succeeded. There is no doubt if I had been quick enough and had known precisely enough what helm to give at the right moment, I should have been able to steer the model quite as well as the automatic apparatus, and therefore it would seem that if the helmsmen of the ship were sufficiently well trained, and if the steering apparatus were powerful enough to give them unlimited command over the rudder, the ship, even unaltered, could have been made to steer perfectly straight on her course. It has been asked whether the model showed any list. I cannot say that she did, noticeably, for no accurate means of observation were used to discover whether she made a list or not. I think it very probable that she may have done so slightly, because the lateral forces to which I attribute the tendency to carry helm, very likely did not act at the same vertical level as the corrective force applied by the rudder, and these two opposing forces would constitute a "couple" tending to incline the ship to some extent. But if there was any list, such list was not the cause of the helm, because we tried the model trimmed by ballast to different very decided angles of list, and the helm was substantially the same. These experiments in the model trimmed to a list, because at first in several successive experiments with the model, she would carry nothing but port helm. We never got any starboard helm, yet I felt sure she ought to carry starboard helm sometimes. We tried several experiments without getting starboard helm, and so I inclined the model first one way and then the other, to see whether that would do it, but it did not. Still I afterwards did get starboard helm occasionally, as I have said in the paper, apparently due to some accidental cause. Therefore it is clear that list is not the cause of the helm. The model did, I believe, make a certain amount of "leeway;" though that we had no very accu-

rate means of measuring; but that again was not the cause of the helm. I admit that I have no absolute proof that it was not the cause in the "Ajax," but it was clearly not the cause in the "Northampton," in the trials described in the earlier part of this paper. The model of the "Ajax" in this case was attached to the towing carriage by this bridle merely (pointing to the model exhibited). She was at liberty to set herself at any angle she chose, providing she came after the towing carriage. She was obliged to follow the towing carriage, but she was not obliged to point in the line of motion; she could have satisfied the conditions of helm by pointing out of line.

Captain FITZGERALD: She must have been.

Mr. FROUDE: No; because this condition (moving the model) could have been obtained; the model pointing straight but being a little bit out of the centre line. We did take some observations of the position of the stern during the run, and perhaps if these had been carefully worked out they would have given us some observations of the position of the stern during the run, and perhaps if these had been carefully worked out they would have given us some measure of how much leeway the model was making; however, it was my impression she was making a certain amount of leeway, but I infer that this leeway was not the cause of the helm angle, by analogy from the case of the "Northampton" model. That model was not attached in this manner (pointing to the model), but was attached by rigid attachments at both ends; the model was therefore obliged to remain straight. Yet I then saw what I described in the early part of the paper, the wake trailing away sometimes on one side and sometimes on the other, in spite of the fact that the model was going perfectly straight; and when the wake was so trailing I found that there was a lateral force on the stern-guiding attachment. I have no proof that there was no force on the bow-guiding attachment, for I did not test it; but there certainly was a force on the stern-guiding attachment, and that apparently answers one of Captain Fitzgerald's questions.

Captain FITZGERALD: I never assumed it was the cause, it was the effect.

Mr. FROUDE: True; but you suggested that the forces which tended to make the model steer acted not upon the stern, but upon the bow. Now I cannot say for certain that no such force acted on the bow, but I can say for certain that in the "Northampton" model such force did act upon the stern, because that was measured. I understood Captain Fitzgerald to say that I suggested the want of directive character as one of the causes of the helm: I wish to explain that I do not myself believe it to be the cause. I merely mentioned it in the paper as one of the causes to which the defective steering might have been colourably attributed; and I did not mean to suggest that I attached much importance to that cause myself. Admiral Colomb suggests that the want of directive character is really the cause, and that the deadwood acts beneficially by improving the directive character of the ship as do the keels. No doubt it does act to some extent in the same way as the keels, yet we see that although it has not so large an aggregate area as the keels, it produced a very much better effect; for whereas the deadwood reduced the angle almost to nothing, the biggest of the keel only about halved it. In my view the fault of the ship is not that she wants directive character, but that she is possessed of a bad directive character, a directive character tending to turn her one way or the other. It is not that she is indifferent to whether she goes right or not, but she wants to go wrong, one way or the other,—powerfully wrong, and that I believe to be due to the one-sided action of the water at the stern. Admiral Brine asks what is the cause of this one-sided flow. I believe from general experience that whenever you have a form that is very blunt at the leaving end, the water is bound to form an eddy. We know it will not flow round from both sides to *this* point (pointing to diagram) but will form an eddy, and in that case it seems that it is willing either to form the eddy on this side, meeting the water flow straight from the other side *here*, or it will form an eddy on *that* side. It won't form two eddies meeting in the middle *that* way. That is my experience, and there are many facts which tell in the same direction. I believe some eminent physicists have gone into the theory of it, and have explained these phenomena to some extent; but I confess I have not followed out the problem myself, I have simply recognized it as a fact.



Admiral COLOMB: Do you mean that the water flowing round from the port quarter forms an eddy on the starboard quarter, but so raises the level that it brings the pressure on the starboard quarter?

Mr. FROUDE: I cannot say I have observed how it produces the pressure, because such a very little difference of level or pressure would produce the force. The areas involved are so large that a very slight difference of pressure per square inch would make all the difference. But where there is a flow of water there must be differential pressures. Where you have a symmetrical flow of water the differential pressures must be symmetrical; where you have an unsymmetrical flow, the differential pressures are unsymmetrical, and then you have no guarantee that the sum of the pressures on the one side will equal the pressure on the other. They may or may not, but at any rate where you have an unsymmetrical flow the chances are the aggregate pressure on the one side will be different from that on the other. Certainly if the unsymmetrical flow results in setting a current in motion in one direction it is clear it must involve a reaction in the opposite direction. The lateral current left by the stern of the ship is an effect due to the passage of the ship. I do not pretend to say why, but the fact is so; and the ship being the operative cause, the cause which has produced the flow in a certain direction must experience the corresponding reaction in the opposite direction.

Admiral BRINE: Why does it occur in one form of ship and not in another?

Mr. FROUDE: I believe it will occur in any ship which is very full in the run, so full that the water cannot flow in symmetrically on both sides.

Admiral BRINE: It is fulness of run that does it?

Mr. FROUDE: It is fulness that does it certainly. We tried some experiments with a half-sized model of the stays of the shaft tubes of the "Iris." They are oval in cross section, something like that (diagram). I refer to the stays which come out from the ship's side to steady the shaft tubes. It was a question of the resistance caused by these stays in the "Iris," and we made a model half size, and towed it to see what resistance was caused. We found very great difficulty in holding the model of the stay, because it quivered with the motion through the water. That quivering was instantly stopped by putting on a sharp tail edge. That sharp edge did away with what otherwise happened and which caused the quivering, namely, that you had eddy behind, an eddy alternatively on one side and on the other.

Captain FITZGERALD: Do not you think you would have steadied it equally well if you had put it on the bow end?

Mr. FROUDE: My impression is that we did not try it on the bow edge only; but it certainly steadied it on the after edge. I do not believe it would have produced any such effect if applied on the bow edge for this reason. We also tried some experiments with pressure logs, and with that view we tried a tube  $1\frac{1}{2}$  inches diameter with a little hole on one side of it, the tube standing vertically towed in the water. We tried turning that at various angles, and obtained a measure of the pressure on the hole at the various angles at which it was placed. Supposing this is the section of the tube on a larger scale (sketching on diagram), we thus obtained a measure of the pressure acting on this surface all round by trying the tube with the hole pointing forwards and also pointing successively at various angles. In front we find positive pressure and at the sides a large negative pressure. All round the back we also found negative pressure, but that was varying; we could not get any steady figure for the pressure. It was always below the natural pressure but always fluctuating. We had in fact a steady pressure on all portions of the surface on the front side, but on the leaving side the pressures were fluctuating, sometimes greater on one side than on the other, and sometimes *vice versa*. It was this fluctuating pressure at the back surface of the oval shaft tube that caused the quivering I have mentioned, and that was done away with by putting the sharp tail edge. In conclusion, to repeat my contention in a few words, I believe the fault of the ship was not that the directive character was weak, but that it was strong, and wrong, and fluctuating.

The CHAIRMAN: I have one duty to perform, and that is to thank our lecturer for the very interesting paper that he has given us. I am sure he will consider it a compliment if I say he is quite "a chip of the old block."

Wednesday, May 11, 1887.

ADMIRAL H. BOYS, Vice-Chairman of the Council, in the Chair.

## COALING SHIPS OF WAR AT SEA.

By Lieutenant C. E. BELL, R.N., Retired List.

I FEEL great diffidence in coming before you to read a paper on such a subject, considering that I have been for so long on the retired list, but the importance of the subject, and the necessity in the opinion of all who have touched upon the subject of some definite and simple plan being adopted, has induced me to come forward in the present instance and lay my plan before you for discussion and consideration, in the hopes that it may prove of service. I shall of necessity occupy but a short time in laying my views before you, as Lieutenant Lowry, R.N., has cut the ground considerably from under my feet, in describing so fully as he has done, the necessity of some definite plan being adopted, and the difficulties and dangers of coaling at sea under existing circumstances, and by the method generally adopted, viz., coaling on the broadside by means of lighters or boats, in his paper on the subject read before this Institution on Friday, 13th April, 1883. All these have also been continually mentioned in the discussions on other papers on naval matters, and are besides patent to all naval Officers. I, however, take the following from Captain Scott's remarks in the discussion of Lord Brassey's paper on Unarmoured Ships read before the Institution of Naval Architects, session of 1876, in which he says: "I think, moreover, that you require, if you have groups of squadrons, somewhat equal coal-carrying power or *means of coaling at sea, which we have not yet hit upon.*" This quotation forms my strongest excuse for putting my views before you to-day, as, with the exception of Lieutenant Lowry's paper, I am not aware of any other having been read on the subject.

In that paper Lieutenant Lowry puts forward a plan for coaling on the broadside by means of coal-boats specially constructed, or else by means of special coal-boxes which could be towed from one ship to the other, hoisted in, and emptied, but I feel sure that all naval Officers will agree with me that by this plan the special difficulties and objections to coaling at sea are not by any means overcome, but on the contrary are somewhat increased by one fatal defect, namely, the cost of the special contrivances by which the operation is to be carried out. I feel sure that all Officers will agree with me that coaling from the broadside at sea is impossible except in very calm weather, and even then is attended with great risk to both men and

material employed. Should there be even a moderate wind and sea it would be impossible, and the detention necessary from the slowness of the operation would be very great.

I have often, as most naval Officers must, seen the great difficulty of coaling from lighters in a partly protected roadstead with ship at anchor and even in harbours in heavy weather.

At Spithead for instance, how often is it extremely risky work coaling in a south-west or north-easterly breeze. I remember once when I was taking out a gun-vessel for the Argentine Government after I had been retired from Her Majesty's Service, the great difficulty we experienced while coaling at St. Vincent to keep the lighters from foundering alongside. If my memory serves me right, one of them did founder on her way off from the shore to the ship, and besides this, the lighters and even the ship herself, a small vessel, suffered considerable damage during the operation, there being a nasty sea on during most of the time. But beyond the danger of the operation there comes a still more important consideration in many cases, viz., the great delay it would cause, which on most of such occasions which would necessitate the work having to be done would in all probability be fatal to the success of the expedition upon which the ship or ships were engaged. Take, for instance, ships despatched to the West Indies to meet an enemy's fleet, obliged to proceed thither in shortest possible time, and from the coal capacity of most, if not all, of our ships compelled to coal *en route*, ships having been despatched to meet them at a certain rendezvous for that purpose; or again in the blockading of an enemy's port, when it would be necessary to coal the ships so engaged whilst under weigh, as no blockading squadron I take it nowadays could possibly with any safety anchor, but would have to keep continually on the move and under steam. Without some safe system of coaling, the necessity of replenishing their bunkers would either cause a number of ships to be continually away for that purpose, or else that under many conditions of weather they would be unable to coal and so remain in an inefficient state, and in some cases a helpless one and be liable to destruction. For these various reasons I believe, and I am sure am supported in such belief by all who have considered the subject, that the only way by which the various difficulties and dangers of coaling at sea can be overcome, and the work carried out successfully with the least possible delay and absence of danger to men and material, is by coaling "from bow to stern," which is the plan I propose to lay before you to-day.

I do not lay claim to any originality for it, as I believe the same idea has occurred to many Officers who have given any consideration to the subject; and in fact on submitting a sketch of the present plan to Sir J. E. Commerell a short time ago, he then told me it had suggested itself to him some years back, and he believed it to be the only way in which it could be done.

I feel sure that had the work to be done it would be done, but I think everyone will agree with me that it will be better to have a definite plan adopted, and the materials for carrying it out ready and to hand, than to leave it to Officers when the emergency arrives to

plan it out for themselves, and to make shift with such means as they can adapt, and besides it would be of great importance that such a plan should be experimented on before the necessity for its use may present itself.

Quoting from Lieutenant Lowry's paper to show the difficulties which have already been experienced in coaling at sea, the result obtained, and the loss of time incurred, he says: "Those who served in the Channel Squadron in August, 1870, will remember the delay of that squadron for nearly a day between Lisbon and Vigo, the hard work, the danger to boats, the great part of a day occupied, and the risks incurred whilst endeavouring to supply H.M.S. 'Captain' with some 50 tons of coal from the bunkers of two other ships. I have neither logs nor journals by me now, but if memory served me right, in fine weather, 30 tons were transhipped in about six hours (enough for two days' moderate steaming), and *this coal was mostly wet*. To avoid risk of foundering, the boats had to carry but light loads, the time occupied being of course lengthened by the fact that steam launches were at that time less common, and less easy to hoist out than now, so that most boats were worked under oars.

"When lying alongside, of course the greatest care had to be taken in sending them off, and during the six hours many narrow escapes from serious injury or total loss were run by the boats. Of course it is much more difficult to tranship coal from the *bunkers* of one ship to those of another, than it would be to do so from the *hold* of a collier, but as labour power was practically unlimited in the ships filling bags, this did not materially retard the rate of transshipment, which appeared to be effected solely by the difficulties of water transport."

In this account he shows plainly the danger and risk attendant on the operation, the serious loss of time, and the miserable result obtained. Of course with proper appliances, the use of steam launches, &c., less time might be lost, a better result obtained, and less detention to the ships, but still the fact remains that under all circumstances coaling on the broadside must inevitably be attended with risk to men and material, great loss of time, and also that it could only be carried on during the day time, or on bright nights; were the weather at all thick or very dark, it would be almost impossible to carry it on, though possibly with the use of the electric light it might be done at great risk.

Any satisfactory plan for coaling at sea must satisfy the following requirements:—

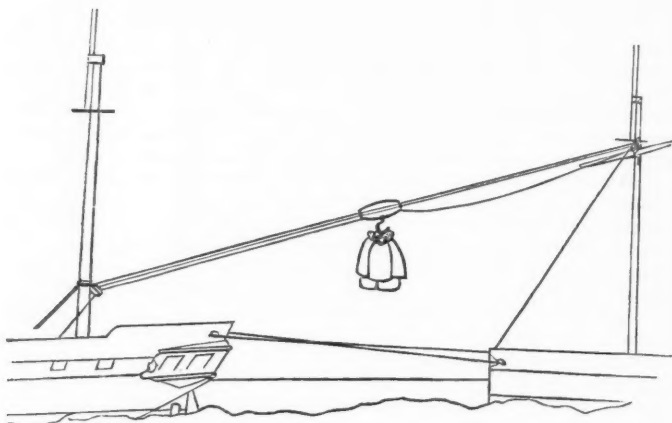
1. Rapidity.
2. Safety.
3. The ability of the ships engaged in the operation to proceed on their course with a minimum diminution of speed.

These three requirements are absolutely essential to the success of any plan, but there are others of no little importance, namely:—

4. Necessity of keeping coals dry.
5. A minimum of labour to be employed.
6. Little cost of material necessitated.

I will now proceed to lay my plan before you, and then to consider how it will satisfy these requirements.

In the present day the colliers that would be employed for such an operation must of necessity be steamers of a high rate of speed, and from the construction generally adopted having straight stems with no impedimenta in the shape of bowsprits or head gear. The coal-ship could therefore be brought up stem on to within but a very few feet of the stern of the ship to be coaled, sufficiently near to allow hauling lines to be hove on board. This could be done even in fairly rough weather, both vessels having full command of steam.



By these hauling lines two stout towing hawsers to be passed carrying with them additional hauling lines. The hawsers to be crossed from the stern pipes of the ships of war to the bow-ports, hawse-pipes, or other convenience of the coal-ship, and secured as for towing. As soon as this is done the two ships can proceed at the rate of speed considered advisable or safe. Two flexible steel wire ropes to be then passed and secured in the following manner.

On board the ship to be coaled, the ends, previously rove through two travellers with patent hooks, to be rove through stout leading blocks, secured by wire strops at sufficient height up the mizenmast, and the ends brought and secured to foot of mainmast. On the coal-ship the ends to be rove through leading blocks on each quarter of foreyard or heads of coal derricks, and ends set up to bollards or other conveniences in the gangway.

The coaling to be carried on by means of either tipping tubs or coal-bags, the former of half a ton capacity, or if the latter, five bags to

one hoist. Should tubs be employed it will be necessary to have either canvas or light sheet iron shoots, down the nearest hatchway, but I should say that although tubs would be quicker filled and emptied, it would be found more convenient under most circumstances, and in view of the distance from the landing of the coal on deck to the nearest shoots or available hatchway, to use bags. The hauling lines to be attached to the travellers and brought to either steam capstan or winches. Two whips on each quarter of collier's foreyard for hoisting up and lowering bags or tubs into the hold.

As most of H.M. ships which would require to be coaled at sea would I believe be of greater freeboard than the colliers, I have advocated the use of foreyard properly secured both at the bunt and by preventive braces where colliers carry a foreyard, but in cases of those not doing so the coal derricks would have to be used.

I find from the tables that the breaking strain of 1 inch flexible steel wire rope is  $1\frac{3}{4}$  tons, weight per fathom  $\frac{3}{4}$  lb.; of  $1\frac{1}{2}$  inch, 4 tons,  $1\frac{3}{4}$  lbs.; of 2 inch, 7 tons,  $2\frac{3}{4}$  lbs. The safe weight that could be carried by a rope so stretched is, I believe, one-sixth of the breaking strain, which of the  $1\frac{1}{2}$  inch being 4 tons gives sufficient margin of safety, and weight of rope being only  $1\frac{3}{4}$  lbs. per fathom, it could be handled without any difficulty.

Three ropes of this description should be supplied to each ship of war for purpose of coaling, and possibly the supply of coal-bags somewhat augmented. These with a proper supply to the coal-vessel would be sufficient. Four tipping tubs should likewise be carried by the collier, to be used when advisable or more convenient than the bags.

The coal-bags having been filled in the hold, to be whipped up five at a hoist attached to traveller and hauled across to the vessel coaling. By the time traveller returns a fresh hoist of bags will be ready to be attached by man stationed on foreyard for that purpose. If tubs are used, the tub on reaching ship coaling to be tipped, hauled back, detached, and lowered to hold, while another ready filled is attached and hauled across. The two sides to be worked independently of one another and as fast as possible. In the case of mastless ironclads as in a blockading squadron, I propose to use the boats' davits on hurricane deck, the boats having been previously landed on the deck and the davits secured.

And now for a consideration of how this plan suits the requirements I have laid down as essential.

1st. *Rapidity*.—I feel sure that by it at the least 12 tons per hour could be easily handled, allowing five minutes for each hoist per side. Possibly it could be worked quicker.

2nd. *Safety*.—There is no danger to men or material, no boats to be swamped alongside or smashed, at the worst only a possible parting of the rope, and loss of  $\frac{1}{2}$  ton of coal and five bags or a tub.

3rd. *Detention*.—It entails only sufficient detention for the passing of the towing hawsers, a matter of a few minutes, certainly not more than half an hour, and the coaling can be carried on continuously by day and night, until a sufficient quantity has been taken in. By the



above calculation 400 tons of coal could be taken in in about thirty-three hours, which though not a high rate of speed is very much quicker than it could possibly be done by coaling on the broadside, with consequent detention of ships, and then only possible in calm weather and with great risk.

4th. *Coal to be kept Dry*.—There is no chance of the coal being wetted unless in rainy weather, which, however, cannot be provided against, and which invariably happens in coaling, but there is no chance of water getting at the bags or tubs in transit as with any system of coaling by boats or lighters.

5th. *Minimum of Labour*.—The only labour required is that of filling the bags or tubs, transporting coal to coal-shoots if using bags, of the men required to detach and attach from hooks and those attending winches, as against the boats' crews necessary by the old system.

6th. *Minimum of Cost*.—This as everyone knows is a matter of great moment in any plan that may be brought forward for consideration and subsequent adoption, and is for this plan of so low a figure, namely, for supply of three flexible steel wire ropes on reels, in certain cases tipping tubs and light shoots, besides travellers, and a small increase in supply of coal-bags, that I think I may fully claim to have met this requirement, though I at the same time would insist that no expense should be considered too great to carry out this most important, I may say all-important, operation in those cases where it may be essential to the success or safety of any ship or ships of the Navy, or any expedition they may be engaged on.

I trust that my humble but earnest endeavour to bring forward a plan for the successful carrying out of this important operation may be of some practical use, and that my shortcomings in laying it before you may be excused by the fact that my training in H.M. Navy was to do work not to write about it.

Commander CHARLES CAMPBELL: Admiral Boys, ladies and gentlemen, there is one thing which I venture to say no naval Officer, absent or present, will deny, and that is the importance of the subject brought before us to-day. I have heartily to join in thanking my old friend Lieutenant Bell for having raised the question, though I must frankly confess I do not agree with him in many respects as to its settlement. That we should have to coal at sea is as certain as any naval prediction can be, and there can be no doubt as to the advantage of a definite plan, tried and exercised. Lieutenant Bell says: "Any satisfactory plan must satisfy six requirements—rapidity, safety, continuation of speed, and three minor ones." Now, Sir, I would submit that rapidity is the one element that is absolutely necessary in any plan for coaling ships at sea. Rapidity with care means safety, and rapidity will render the continuation of speed of less importance. The question at issue seems to me to be broadside *versus* end-on coaling from steamers: for I can scarcely imagine anyone attempting to originate a system for coaling boats at sea with boats, lighters, or floating coal-boxes; therefore we may fairly dismiss the water carrying from the discussion altogether, and devote our time to coaling direct from steamers. Lieutenant Bell says: "For these various reasons"—the reasons that he has expressed—"I believe, and I am sure I am supported in such belief by all who have considered the subject, that the only way by which the difficulties and dangers of coaling at sea can be overcome, and the work carried out successfully, with least possible delay and absence of danger to men and material, is by coaling

from bow to stern." He is quite distinct about that. Now, Sir, I would not, with all due deference, dismiss the broadside coaling so summarily and completely from the future as the writer has done. After many years' practice in coaling from steamers alongside in open roadsteads, I hold that rapidity is unquestionably in favour of the "broadside," in the proportion of at least ten, and I may say twenty to one. Like a great many things at sea, it depends on the weather, and until the vessel receiving the coal commences to roll sufficiently to endanger the safety of either ship I maintain that the "broadside" has immeasurably the advantage, and I do not believe that "end-on" coaling will be resorted to, except in the case of very rough weather, and even then I must confess that as a matter of seamanship it presents to my mind little to recommend it as to safety. For instance, to have the bow of a collier bobbing up and down in close proximity to my twin screws and rudder is not a position that I should go out of my way to seek in a heavy sea. Again, the special fittings suggested in the paper do not seem to me to be so simple as those required for coaling alongside; which I take it would be derricks, which would run ten bags at a time out of the hold, and land them on the deck of the vessel coaled; or, in the case of low freeboard turret vessels, tip into a shoot connecting both vessels. At least two winches, derricks, and hatches would be at work at the same time, putting on board, under ordinary circumstances, one hundred tons an hour, or more. Specially fitted naval colliers would carry raft water-borne fenders, to keep them at a safe distance. That colliers should be specially fitted for coaling at sea, and that we should be able to put our hands on them at short notice in the event of a naval war, is now generally admitted, and though I am of opinion that we shall still coal from the broadside I see no reason why the "end-on" plan should not be fitted, as an auxiliary, in case of emergency. "Try all things," as Saint Paul said, and hold on to what proves to be good. In a fleet (as I shall have the honour of suggesting on Wednesday next), your coaling and attendant colliers will have to be systematically organized on the basis that one thousand tons should always be present for every fleet unit of your force, and they must be fitted for rapid coaling. But cruisers and other solitary men-of-war will have to take pretty well what they can get, and coal where they can, and they will have to improvise the means. There will be difficulties, no doubt. Well, Sir, it is the seaman's pride that difficulties do not interfere with carrying out an operation, and it is his business to overcome them. Goodness knows where you will have to get your coal from; let us hope it will be from the hold of an enemy's collier, if we happen to get hold of one. The lecturer suggests the possible use of the electric light for coaling, and of course it would be used, and always is in peace time when a collier comes to a fleet with a limited number of days to discharge in. Practically it is as good as daylight, and it certainly can be used with far greater effect in broadside than with end-on coaling. There is very little difference in speed—only some few tons an hour. With regard to the question under discussion, I am decidedly in favour of the improvement and development of the "broadside" system; but should the "end-on" be fitted I would not trust to the chance of there being a foreyard, or even a foremast, and would suggest a hollow derrick mast, specially constructed, well forward, large enough to allow tippers to travel inside it on an endless chain worked by steam, continually tipping into a strong shoot, led from the derrick head to the deck of the receiving vessel, on the mud dredger principle. Lieutenant "ell feels diffidence, owing to his having been so long on the retired list, but I think the meeting will agree with me that we are indebted to anyone, whether retired or civilian, who can bring forward one of those vital questions which are crowding on us with increased rapidity from day to day, in so clear and concise a form. I do not agree with him, but I admire his principle, and I sincerely hope that his paper may help to give another blow to the "happy-go-lucky system," and assist in bringing about that systematic organization on every detail for which the Navy is crying out with one voice, and which is now happily receiving the special attention of our rulers.

Captain N. H. HENDERSON, R.N.: I quite agree as to the immense importance of coal supply for ships when engaged in naval operations, but I do not think either the proposed "broadside" or "end-on" system of coaling at sea is hardly practicable except in perfectly smooth water. So seldom in open water would a fit day

occur, and so altogether dependent would it be on chance, that no Commander-in-Chief could rely or trust to this means of replenishing his fuel supply, where time was an element of consideration, and the success of his individual, or of combined strategical movements, depended on exactitude in this respect. It would be safer to allow for detention by the way for this purpose, in making the calculations necessary to render any operation complete, even if the place of shelter sought caused a considerable deviation from the direct route or course. If there is the least swell ships in tow cannot be kept close together, their periods are so different that if the towing hawsers have not great play they will snap at once; and the towed vessel surges not only in a fore-and-aft direction, but also to starboard and port, this would bring such a strain on the carrying ropes they would soon be broken. I think the first consideration, even more so than speed, is that ships should carry a good coal supply, and in the organization of ships and squadrons for naval operations, every cruiser, and every ship of a squadron not operating within the immediate vicinity of a "base," must lose her attached steam collier acting under her orders. In future wars, the question of coal being contraband when supplied to the war vessels of belligerents is sure to crop up, and the regulations imposed by neutrals will be more and more stringent, until in all probability, coal supply will be altogether refused; but there is so far as I am aware nothing to prevent the transference of stores from one part of an organized squadron to another when taking shelter in a neutral port. I believe this question can only be settled by the proper organization of units and squadrons, and that each unit must have its quota of "transport," without which, as with an army, it cannot operate; also that in the naval operations of the future, "bases" will have to be fixed, "temporary," and "permanent," the latter being of course our fortified coaling stations. If a blockade is undertaken, you must have a "base" from which to work, the permanent one from which the transport of the fleet will draw its supplies and to which its colliers will repair to fill up with coal, and a temporary base to which the blockading fleet will go, one at a time, to complete with coal and stores, for the fleet must be large enough to admit of this. The "temporary base" would probably be a shifting one, an island or anchorage seized and held, as close to the blockaded port as possible. Lieutenant Bell has mentioned the question of labour: whenever a ship coals, even a hundred tons or so, it means dirty work for everyone concerned, and large amounts mean heavy labour for "all hands," especially as no consideration has been given to the necessity of fitting ships for rapid coaling, which should be one of the most important evolutions in the ship; as it is, coaling more or less capsizes a ship, all sorts of dodges have to be resorted to, the whole mess-deck having often to be cleared; it makes her filthily dirty, for coal-dust penetrates like water, it takes fully twenty-four hours to thoroughly clean a ship after the operation, and until this is done she is not in a fit state to go into action. If ships have a very limited coal supply, it would not be safe to trust to the "weather" for coaling at sea by the "end-on" system; any aims or operations that the Admiral commanding a squadron had in view would be probably frustrated did he do so, and it seems to me that the diminution of speed to a squadron, especially if the ships have to coal singly or in pairs, would involve as much loss of time as if they repaired to an anchorage for the purpose, without the corresponding advantage of certainty. Believing it would not be safe to trust to this system, there is no reason why it should not be practically put to the test. There is I know a strong idea that petroleum is coming to the front as fuel, but it is not within the range of practical naval politics as yet, and may not be until after another great war.

Captain FITZGERALD: As we are all agreed on the importance of this subject, I do not think any apology is necessary on the part of any naval Officer or other person who brings it before this Institution. I am sure we should all be delighted to find any means by which we could coal at sea. I agree with the last speaker in saying that I do not think either the end-on or the broadside system of coaling is sufficient. My reasons for saying so are somewhat as follows. The lecturer talks of a ship going under the stern of another one, and within a few feet, and throwing lines on board. I scarcely think he can have had so much experience in towing as I have had with heavy ships, or he would not have made that statement. One essential for a ship to be taken in tow is that the two ships must maintain an

accurate speed, and that the power of steering and altering speed shall be in one ship only. Let us imagine that we have a vessel in tow at a distance of 40 or 50 feet in order to commence your operation of coaling. It appears to me that what would happen would be this: you would be towing very nicely with your hawsers taut, you would get your 1½-inch hawser tolerably straight; you would then hoist up your half ton of coal and haul away from the towing ship. It seems to me that as soon as that half ton of coal got into the middle of that hawser there would be a collision; the extra weight of that coal on the sag of your hawser would bring the vessel you are towing into your stern at once. I have not a doubt in my own mind that that would be the first thing that would happen, and that would be awkward. The result would be you would either damage your double screws or carry away your rudder. The lecturer says that as most of our new ships are mastless he would use davits. I do not think they would be high enough to carry the coal clear of the stern; that would be another objection. I have thought a good deal about this subject; it really seems to me we shall never coal at sea with anything like success, and that the only way to be able to replenish our fuel will be when we come to liquid fuel. The lecturer has not mentioned torpedo-boats, but that seems to me the most important of all the points of coaling at sea. If we could have liquid fuel for our vessels there would be no difficulty whatever; we could lay out a small hose of any length you like, pump your oil through, and there it would be. I have not the slightest doubt that before a few years are up we shall see liquid fuel used at least for torpedo-boats, and then we shall not hear of those exploits that we heard of in the French squadron in the Mediterranean the other day when trying to get coal into the torpedo-boats. I have not any doubt that it will come to oil. I should like to see Lieutenant Bell's plan tried, but I have no doubt in my own mind that it would fail absolutely and entirely from my knowledge of towing at sea. The whole subject is of more importance to foreign nations than to us, although we should not be above taking up a feasible plan if one can be found. We have more coaling stations abroad in all parts of the world than any other nation; and if we are wise and arm them we shall have absolute command of the whole business, putting on one side neutral ports which are not supposed to give coal to belligerents. Having these coaling stations we ought to be able to command the tactics of the ocean, and ought not to want to coal at sea. As to blockading, I think it is a thing of the past absolutely; you could not blockade in these days of torpedoes anywhere near an enemy's port, therefore, although coaling at sea may be of importance to us, it is of far more importance to nations who have no coaling ports, and it would be to our disadvantage that any practicable means should be found for doing it.

Rear-Admiral COLOMB: The lecturer spoke of the plan as not being new. I know that it has been in my own mind a great many years, and I am nearly certain that it did not originate in my mind, but somebody put it there. I thought there had been a paper read on the subject in this Institution some years ago, but I believe that the only paper known is Lowry's, which did not take this line. On the general question of coaling at sea, I do not find myself quite in agreement with anybody. I agree very much with what Captain Fitzgerald has said upon the point, that the control of the coaling is in our hands. If we have sense enough to keep it, there is no doubt about that; we have our coaling stations, and it is a mere question of keeping them to make us secure. I agree that the question of coaling at sea is a thing more important to our enemies than to us generally speaking; but on the one point that Captain Fitzgerald addressed himself to, that of blockade, it seems to me is the very point that touches the question of coal. Captain Fitzgerald says blockading is a thing of the past. Now I will not go into the question of blockading, because I have to go into it fully later, but if the question of blockading is a thing of the past, I must say I do not know where we are. It seems to me that there is nothing before us but to watch and to mask the fleets of our enemies wherever they are. If we have not the power of doing that I really do not see what we can do. If we are never going to watch an enemy's fleet in his own port again, then the power of coaling at sea does not seem to me of such great importance. But I do sincerely believe that we are going to watch our enemies where they are, in spite of torpedo-boats or whatever it may be. I am sure the

English Navy will always go where the enemy is, and will hold on to the enemy until he has finished with him, and I know we cannot do that in cases where an enemy is in his port unless we have coal at our disposal there while at sea, or unless we have very large relays so as to enable us to keep a sufficient force watching the enemy while the rest of them are away coaling. Therefore, from my point of view, the question is of vast importance to us. As to the difficulty of coaling from lighters and boats, I do not think I need go into that. We all know how very great the difficulty is if there is the slightest lop of a sea on. I am a little surprised at Captain Campbell speaking of the broadside system of coaling, because that entirely depends on smooth water.

Commander CAMPBELL: I think most of our coaling will be done in smooth water.

Admiral COLOMB: If we had the control of the weather I should agree, but it appears to me that a system of coaling at sea where we are moderately independent of the weather, and where a moderate sea will not stop us will have great importance for us, always falling back upon that question of our fleet being at sea, and the enemy's fleet kept secure in harbour. Following Captain Fitzgerald I had noted the remark he made about the chance of the weight on the centre of the guess-warp bringing the ships together, but after all it crossed my mind the moment I noticed it, that you towed quite light ships with chain cables without bringing them together very much more than with light hawsers. We all know that. It would seem to me to depend a good deal on the relation between the half ton of coal which is in mid-air, the size of the ship astern, and the rate at which she was going. It would all seem to depend upon that. We could not make sure that the difference would be perceptible without experiment. The whole arrangement seems to be a matter for experiment, and I do think it is important enough to be put to that test. Nothing else will settle it. If it is found that the objections to it do not exist, it will be a convenient thing to have the plan at our command even if we do not habitually use it in peace time. But it is in peace time that the experiment must be made, and it is in peace time that we must know exactly what preparations we want, what appliances we want, and at what rate we can carry out the coaling. We might talk in this Institution for a very long time, but we could not really get a bit further as to the particular merits of the plan. I may say that I like that idea better than the broadside idea, simply because it seems to me that you are more independent of weather than on the broadside plan. If you have your colliers regularly fitted to attend upon the fleet I see no reason why they should not be fitted for both plans. I strongly agree with Captain Fitzgerald that it is the petroleum question that is going to settle a good deal of this matter for us; every day that I live now convinces me that liquid fuel is coming on at a great rate, and once you get the liquid fuel it will be a very good thing in some ways, but will be a specially bad thing for us in the facilities which it will give our enemies to coal at sea for the reasons which Captain Fitzgerald has adduced, because practically at the present moment we have the control of the coal on the high seas, and our enemies would share it with us if petroleum came into use. It is remarkable to recollect that none of the Federal raiders, neither the "Alabama," nor the "Florida," nor the "Sumter," ever coaled at sea, and it is an important thing to note that the "Sumter" had to be sold at Gibraltar simply because it was a neutral port, and she could not get coal. For that reason and no other the crew had to be sent home to America, and the ship sold. The "Alabama" had once or twice colliers sent out to her, but she invariably took them to places appointed, to deserted islands and bays in the West Indies, and coaled alongside there. It never seems to have struck any of their minds that they could coal at sea. It seems to me rather remarkable that that should be so, somewhat pointing to the great difficulties that really exist for getting in coal on the broadside, because there was no reason why they should not have chosen a calm day, got a collier alongside, and taken the coal in. The question has been raised as to the coaling of torpedo-boats at sea, and I feel always a little doubtful about the torpedo-boat at sea, or as to the range of its useful action being so far from the harbours and the immediate vicinity of the harbours. I therefore do not think it is right for us at this present juncture to get the idea into our heads that any torpedo-boats that we have at present are suitable for remaining with a fleet at sea. We know quite well that the great speed

which they have in smooth water drops considerably when the sea is heavy, and therefore I think in coaling stations questions, as in all others, we had better not cook our hare before we have caught him, we had better not think that the torpedo-boats form part of our seagoing fleets, and are to be considered in this question until we know that they are competent to accompany our fleets, can go at the same speed at which our fleets go, and can keep the sea as our fleets keep it. I thank the lecturer very much for bringing this important question forward.

Lieutenant TUPPER: As I have always taken a great interest in the question of coaling ships at sea, I venture a very few remarks on the subject. Without wishing in any way to disparage Lieutenant Bell, I must inform him that in August, 1883, I sent a plan very similar to his to the Admiralty. Their Lordships thanked me for it, and that is all I have heard about it. However, there are many points of difference in details between the two plans. I think that in future wars we must still blockade enemy's ports and keep the sea, and must, therefore, be able to coal at sea, and I think that the "end-on" plan is the only one that will meet the case. I will give my reasons for not coaling on the broadside later on. In the first place, my plan is roughly this. I cannot at all agree with having ships so close together. My scope between the ships is much greater than in Lieutenant Bell's, and I have an endless wire hawser arranged so as to be slacker than the towing ropes, the steam capstan of the ship taking the other in tow causes the wire hawser to move, it being taken round the capstan. It is considered that the man-of-war should take the merchant ship in tow. Special blocks are fitted to the yard-arms for this hawser to reeve through, and the buckets are carried by short wire pendants hanging at regular intervals from the wire hawser. I propose, with the permission of the Council, to send an illustration and full description of my plan, and to ask that it may be inserted in the same Journal with this method of Lieutenant Bell's, so that Officers when they read it may pick both plans to pieces and improve upon them. My principle is more or less the same as that put forward by Lieutenant Bell.<sup>1</sup> Captain Campbell has spoken in favour of coaling on the broadside at sea, but I do not think he has taken into consideration the extraordinarily thin-sided ships that we now have. When I was out in the "Collingwood" one day a tug came alongside, and although there was no sea on, by simply sheering in with a cork fender out she made a large dent in the "Collingwood's" side, so that I think any idea of a fender to keep a ship off in a seaway would not answer at all with our modern vessels. Then, again, we had an instance the other day in the case of the "Landrail" which, from simply pressing heavily against a landing-stage, or wharf, or fender, sprang a leak and had to come into dock. It was not a collision, merely she pressed heavily upon the stage, and the thin steel was indented and crushed in so much that there was a leak that had to be made tight in dock. I mention these instances to show that I do not think that coaling on the broadside, even with the use of fenders to keep the ships apart, is at all practicable. I have thought of the plan of using for fenders some sort of spars with a ball and socket joint at each end, or some arrangement of that kind, their ends being fixed to specially strengthened places in the ships' sides, so that the spars would give easily with the motion of the ship. I have consulted engineers as to this idea, and they say that the motion of the waves is so peculiar and so difficult to deal with that they did not think any arrangement of that nature could be utilized. As regards liquid fuel, every one admits that that is the fuel of the future; but while we are waiting for that, I should like to know if anybody here could give us any information as regards anthracite coal and its use in the Service. I find that anthracite coal gives much better results than the ordinary coal that we use, and we are recommended to burn two-thirds anthracite and one-third bituminous for steaming purposes, but we never do it. There was a steamer called the "Livorno" which steamed from Liverpool to Gibraltar, using anthracite coal, and she made 729,004 revolutions with 91 tons of anthracite (averaging 9.66 cwt. per hour). Steaming from Gibraltar to Genoa she then made only 556,920 revolutions with 136 tons of bituminous steam-coal, burning 16 cwt. per hour. Working out the proportion of that you will find that in 636 hours' steaming she saved no less an amount than

<sup>1</sup> Lieutenant Tupper's paper follows this.



200½ tons of coal. That is a large amount, and the question might be worth considering whether it would not be advisable to use anthracite coal in our war vessels, particularly with regard to torpedo-boats, for it would increase our coal carrying capacity tremendously; it stows into a smaller space than any equal weight of other coal, and evaporates a very much greater quantity of water per 1 lb. of coal. A pound of anthracite will evaporate 12·43 lbs. of water, and a pound of bituminous coal only 8·19 lbs. of water. It seems almost worth while considering whether it would not be advisable to fit the furnaces of our torpedo-boats for the use of anthracite; you require about a square foot of grate surface, because it would increase their coal storage. To burn anthracite it is necessary to keep a thin fire, and to have about one square foot of grate surface per horse-power. The latest development of an American Transatlantic steamer, the "Pocahontas," is to burn anthracite coal only, and is to steam 22 knots. I think the practice of coaling a ship both at sea and in harbour ought to be made just as much a drill and evolution as are many other operations which have to be performed. There are all sorts of ways of coaling in harbour, and different Commanding Officers do it in different ways. I have seen a good deal of it, and the steam-winch for getting the ashes up have always been a great assistance in hoisting coal-bags. These ash-hoist winches, however, are always put in an inconvenient place, so that when using them for coaling you generally manage to cut all your ropes used for whipping in coal. These winches might be put into such positions that they would be convenient for hoisting up the ashes, and at the same time be in a good position for hoisting in coal-bags. I think more might be done by naval architects to increase the facilities for rapid coaling in vessels of war; it seems that hardly sufficient prominence is given to the question of coaling in the design of ships, it is generally very difficult to "turn" it into the bunkers; perhaps the apertures to the bunkers might be made larger and more numerous, and I think that an oblong shape would be preferable.

The CHAIRMAN (Admiral BOYS): There are one or two words I should like to say before thanking the lecturer, in your name, for his interesting paper. With reference to the proposal as represented in the diagram before us, I see no practical difficulty against its being adopted, but there, as you see, it is in perfectly smooth water, all the ropes are equally tight, the ships are at all times exactly the same distance from each other, and there is no divergence in the hauling and tow lines. But if those ships should get into any seaway whatever, the operation, I believe, must break down. It is not only the ships' stems and sterns that move, but there are ropes at considerable distances from each other, some high in the air, and the motion up there in all directions is vastly in excess of what it is down below. One ship rolls one way, and the other another way; the towing ship's bow pitches up, while the towed ship's stern scends down. Something must carry away. I can, however, foresee certain conditions under which this plan might be applicable and useful, viz., in perfectly smooth water when delay might be of vital importance, so that instead of a ship having to anchor to coal she might be continuing her voyage and coaling at the same time. With regard to ships towing so close, I do not think it is at all necessary. Someone hinted that they should be at a distance of 30 or 40 feet, but it seems to me there is no reason why the distance should not be 20, 30, or 40 fathoms, if it is smooth water. As to the weight on the bight of the guy-rope drawing the ships together, that is simply a matter of calculation. If a half a ton should draw the ships together, which I do not believe it would with ships of any size, or at any speed, that weight might easily be reduced until you arrived at a point where it did not draw them together. As to blockading, if we are to blockade, the practice of coaling at sea, by boats or otherwise, will occasionally be adopted. I think that blockades must be established, but the question is what do we propose to blockade. I believe an attempt to blockade an enemy's merchant ships in port will be attended with much difficulty, it will be almost impossible; but if it is required to blockade in a port the bulk of the enemy's fleet, I believe it can be done, I believe it will be done, and I believe we shall do it. Liquid fuel is in the future; it is not before us at present. When liquid fuel is introduced, many of the present difficulties in coaling will disappear. With regard to towing, Captain Fitzgerald has had considerable experience, and so have I. While towing the Bermuda

Dock across the Atlantic with the "Warrior," communication was opened between the towing ship and the dock, not through the air, but through the water. Occasionally provisions were passed down. A watertight case was contrived by which we could send documents and light articles, possibly a bag of coal might have been sent, but I do not think much more than that could have been done. As to one large ship taking another in tow, that depends upon the description of the towing ship. With such ships as the "Warrior," "Black Prince," or "Achilles," which steer beautifully, there is no difficulty. The "Warrior" has on several occasions taken a vessel in tow without lowering a boat, but I do not think that in Captain Fitzgerald's old ship, the "Hercules," such a thing could be done without some risk, and I am sure that with the "Inflexible" or the "Glatton," or flat-bottomed ships of their type, it ought not to be attempted. They do not steer with sufficient accuracy. Taking in tow in their case is a more difficult operation. I will now ask Lieutenant Bell for any observations, in reply, he may have to offer.

Lieutenant BELL: In rising to answer the various objections that have been made, I think some mistake has arisen as to the distance. In the first place, in proposing to take the coal ship in tow, I never had it in my mind, and I cannot see how it got in anybody else's, that we should endeavour to take her in tow at full speed. I should have thought any sailor would go to work to slacken speed before attempting to take a ship in tow. Certainly it was in view of that that I spoke of a detention of perhaps half an hour in taking in the towing lines.

Captain FITZGERALD: I do not think any one assumed that she would be taken in tow under weigh.

Lieutenant BELL: Then I beg pardon. That diagram only shows the position of the two ships. As to the distance between them, I stated that you might bring the coal vessel up to within a few feet for the purpose of taking in the hauling lines, but as to the absolute distance, I did not lay it down. I only gave the plan and the suggestion that it would be at no very great distance; that would be a question with those concerned as to what would be a sufficient distance to tow at for the purpose of coaling. Captain Campbell says it would be very much quicker to coal on the broadside. Most undoubtedly it would be so if you can possibly do so, but the plan I have laid down is for coaling when it would be utterly impossible to coal from the broadside. I do not know whether he would like to coal at sea even in calm weather in the Atlantic with a good swell on, which I think is generally the state of the Atlantic. In the Pacific, where you get a more quiet sea, you might be able to coal on the broadside, but I doubt whether you would be able to do it in the Atlantic even in calm weather. There is always a heavy swell on, which would be a great deal worse than a short sea. Captain Fitzgerald spoke about the weight of the coal-box bringing the two ships together: I have asked engineers on that point, and they said I need not take it into consideration, that looking at the probable size of the two ships performing the work, half a ton of coal passing there need hardly be taken into consideration, especially if the ships were proceeding at a high rate of speed. I have not worked it out nor had it worked out, but on my asking their opinion that was what was given to me. I have not entered into the question of torpedo-boats, never having had anything to do with them. The object of my paper has been to meet the case of ships being obliged to proceed at a high rate of speed to meet an enemy's fleet when it would be necessary to coal at sea at all hazards. Undoubtedly where coaling could be carried out on the broadside by all means do so, for it will be done in about one-third the time, if not quicker. I do not think there are any other things that I have to reply to.

The CHAIRMAN: It only remains for me to thank the lecturer for his very interesting paper. The subject is a most important one, and the truth can only be evolved from real experiment.

## METHOD OF COALING SHIPS AT SEA.

By Lieut. REGINALD G. O. TUPPER, R.N.

At a lecture on the above subject, delivered by Lieut. C. Bell, R.N., on May 11th, I was somewhat surprised to see that his method of performing this difficult operation resembled very closely in many points a method that I had devised and submitted to the Admiralty for their consideration on October 3rd, 1883. I am one who firmly believes that it will be absolutely necessary, during the next naval war, for fleets to cruise about with a large number of transports in their company, containing coals and War Office stores, *i.e.*, shot, shell, powder, &c., and that the fleets will have to replenish their stores *at sea* from their transports. Supposing that I prove correct in my opinion, at present, some method will have to be improvised out of ships' resources, for coaling, &c., at sea; this would not be as efficient as a recognized plan which was the outcome of experiments in peacetime, and of suggestions contributed by a large number of experienced Officers. It is therefore in the hope that by adding my suggestions to those of Lieutenant Lowry and Lieutenant Bell, we shall give our readers a larger scope for criticism, and elicit new ideas from experienced Officers, as well as improvements in our own suggestions, that I lay my plan of coaling a ship at sea before you. It is as follows:—

The man-of-war requiring coals is, if larger than the collier, to take the collier in tow; my diagram supposes this to be the case.

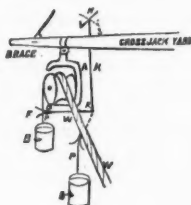
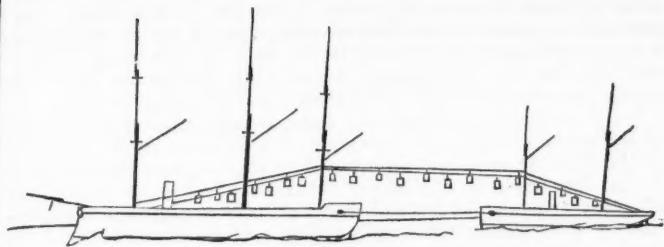
The vessel to be coaled lowers her crossjack, or, if not strong enough, her mainyard, to within about 30 feet of the netting, and secures it there squared and as rigid as possible.

The collier performs the same evolution with a special yard on her foremast.

At each of the four yardarms, a strong iron snatchblock is secured, and there is also a special fitting to enable the pendants carrying the bags or buckets of coal to pass over the sheave properly.

A steel wire hawser is then taken round the steam capstan of the man-of-war, the ends are rove through the yardarm blocks, and then through special iron rollers on the deck of the collier; the ends, which are fitted into eyes, are to be either lashed together or shackled. The collier supplies iron coal-buckets or bags, to contain about 2 cwt. of coal, and fills them from her hold, and these are hooked to wire pendants spliced into the steel wire hawser at regular intervals.

The man-of-war then heaves round her capstan, and as the hawser is thus hove in, the coal is carried in the buckets or bags across the intervening space, full buckets passing in, say on the port side, and the empties returning to the collier on the starboard side; a continual flow of coal is thus passed into the vessel requiring it as long as the weather will admit of the collier remaining in tow.



A, special iron snatch-block, the top of the sheaf flush with the shell, and the outer part of the shell, *a*, is curved outwards.

BB, coal-buckets or bags.

WW, the wire hawser.

PP, the wire pendants spliced to hawser and having a hook at other end.

KK, an iron spindle, having a handle at upper extremity, a shoulder at S, which supports the spindle, it being rove through the yard. The lower extremity is bent at right angles and carries a fork, F. The handle, H, is worked by a man sitting on the yard, who catches the pendant in the fork and then swings it round as the splice travels over the sheaf of the block.

N.B.—The dotted line with handle shows the position of the spindle when catching the pendant.

At first it may seem that the blocks at the yardarms will stop the transit of the pendants carrying the buckets, but I propose to overcome this difficulty by the fitting shown in Diagram II, viz., a vertical spindle through the yardarm, having a handle within easy reach of a man or two men sitting across the yard, its underneath part being fitted into a horizontal arm, at the extremity of which is a wide-pronged fork.

As the pendant approaches the snatchblock the men stationed on the yardarm will turn the fork so as to catch it, and will then turn the handle and lock it, so as to bear the pendant out in line with the yard, releasing it again as the pendant falls over the block, and turning it then forward (or aft), so that the pendant will be released from the fork.

Another efficient method of overcoming this difficulty may be by having a wide spreading semicircular rail projecting a few inches

beneath the snatchblock, of sufficient size to prevent the pendant swinging inside it as the ship rolls; if this plan be practicable, being automatic it possesses a decided advantage, and I see no reason why it should not answer in allowing the pendant to slide round it, but it certainly has the disadvantage of probably causing the bucket to swing violently on leaving it, and thus some coals might be lost.

I will conclude by saying that I think vessels performing the duties of colliers, storeships, and transports to a fleet, should be large and of the highest speed, and armed with quick-firing and machine-guns, so that they might be utilized as scouts for the fleet, and in the capture of enemy's commercial fleets when not actually employed in the operation of transmitting the supplies they contain to the ships of the fleet to which they are attached.

In my opinion the ordinary 9- or 10-knot cargo boat would not be the right type of vessel for the service.

In my remarks on Lieutenant Bell's paper, I have alluded to the impracticability of coaling ships alongside at sea. I will repeat here, that my reason for this objection is, that the sides of the modern men-of-war being as a rule constructed for the greater part of the ship's length of thin steel, no kind of fender could prevent large dents, if not holes, being made in their sides by the friction and bumping of the fender against them.

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Wednesday, May 18, 1887.

REAR-ADMIRAL RICHARD WILLS, Member of Council, in the Chair.

## THE INTERIOR ECONOMY OF A MODERN FLEET.

By Commander CHARLES CAMPBELL, R.N.

### *Introduction.*

THE title of this paper embraces a subject to which it would be impossible to do justice in the time at my disposal: I shall therefore confine myself to a few suggestions with a view to gain in discussion the valuable opinions of the members who have done me the honour of attending.

The revolutionary state of things which is going on in everything connected with a floating fight has again and again been pointed out both at this Institution and elsewhere. What was good and proper yesterday is obsolete and condemned to-day; and who knows that to-morrow may not call into existence some new subaqueous or aerial machine which will make it absolutely necessary to build ships that will float bottom upwards, or on some other system, contrary to the patterns in office? I fully agree with Captain R. H. Harris in his lately published essay,<sup>1</sup> where he states that "he errs not when he predicts that the immediate future will see far greater and more astonishing changes than any of those which he had so summarily discussed."

Under these circumstances, in regulating the interior economy of present and future divisions, squadrons, or fleets, we must strive our utmost not only to "keep pace with the inventions of the day and ahead of all maritime Powers," but to organize and exercise in keeping with adopted inventions, so as to be able to use them with greater effect in action than any maritime Power; and above all, when any thing connected with the fighting capabilities, propulsion, or exercise of the units or their component parts, is condemned and proved to be bad, root it out and have done with it!

In a former paper on "The Interior Economy of a Modern Man-of-War,"<sup>2</sup> I gave the detail of what then took place from day to day in a fleet ship, the discipline, distribution of responsibility, and a short review of the changing drills and exercises.

I now propose to follow up that paper, and endeavour to show how

<sup>1</sup> See *Journal of the Institution*, No. 134.

<sup>2</sup> *Journal*, No. 119.



the coming units of a naval force may be organized, exercised, and massed together, so as to develop to the very utmost extent their offensive and defensive powers.

In dealing with the past and present, I have only endeavoured to be accurate, and in suggesting the possible composition and routine of the future, I will limit myself to the proposal of plans which are daily and hourly forcing themselves on those whose business it is to prepare the Royal and Mercantile Navy for the strain which must be put upon it in the event of an outbreak of war with powerful naval nations; when it would undoubtedly be called upon to capture or destroy the enemy's ships-of-war, blockade his ports, ruin his trade in all parts of the world, at the same time protecting our own trade routes, making quite sure of our own food supply, and last, but not least, by finding and attacking the force he might succeed in getting to sea, rendering it quite impossible that any part of our Imperial coast should be subjected to the ordeal of foreign attack.

I will not further enlarge on these duties or on the thousands of reasons there are which make "unmistakable naval supremacy" of paramount importance to this country; but I will refer to Admiral P. H. Colomb's Gold Medal Essay,<sup>1</sup> and to Lord Brassey, vol. i, Chap. I, where they are described at greater length than I have space for, and with greater force than I can bring to bear; but with whom I most cordially agree.

That these important duties necessitate a large naval force must be patent to all. Still there is a great deal to be done by the careful organization of existing ships, and a systematic arrangement of the component parts of the several classes of Royal and mercantile vessels which will assist in carrying out the various operations.

I do not propose to enter into the question of building fleet ships; but I will endeavour to give the detail of a scheme by which we may make the most of what we already have built, are building, and shall build in the ordinary course. Even if the purse at the constructor's disposal were more elastic, the difficulty in the building of fleet ships would still be "how to employ it." The pioneers of naval prediction even now go so far as to say that "the days of the powerful ironclad are numbered;" and without following them to that conclusion, I hold that more large and costly ships of any type, however good, than you can officer, man, or manœuvre may prove a grave error in judgment, and cause the expenditure of funds which are badly needed to bring the adjuncts and auxiliaries to the proportion which has shown itself to be necessary in the composition of the base unit of future fleets. It must also be borne in mind that though it is probable that ships will destroy each other more frequently than in the sailing days, still I venture to hope that we may count upon capturing a few anyway, to replace those which may be blown up or rammed; and besides, the extreme longevity of ships, boilers, and machinery will render the building of fleet ships less frequent when we have a sufficient number ready to fill their places, in a definitely organized scheme of fleet strength.

<sup>1</sup> Journal, No. 94.

We are assured both on foreign and home authority, that the microbe is to eat away the mammoth from off the seas. But I am inclined to think that it will be some years yet before the microbe can act without the mammoth as a base.

As long as you have to carry monster guns to attack forts and shell arsenals, so long you must have monster carriages in which to transport them; so that the action of the microbe and the mammoth must be blended for mutual support in the unit, division, squadron, and fleet of the future.

In my opinion, the numerical strength of a naval force is not of so vital importance as its unity, flexibility, mobility, organization, efficiency, and the tactical skill of its Admirals, Commodores, and Captains; the absolute certainty of its coal and store supply, and the systematic arrangement of its adjuncts, auxiliaries, reserves, and repairing resources; and it is owing to this conviction that I have prepared this paper in order to lay before the members of this Institution the result of my exceptional experience in flagships, together with the changes and additions which that experience has led me to believe are necessary in the composition, routine, and exercise; dealing entirely with what we have or shall have in the immediate future, and referring to matters with which you are all familiar.

As far back as 1872, the necessity for adjuncts to the line-of-battle ship of that day and of the then future, was forcibly impressed on my mind, as will be shown by the following extracts from an essay written in that year for the Junior Naval Professional Association, and published in the "Gun, Ram, and Torpedo," 3rd Essay, Chap. V, pp. 37, 38.

(1.) "The line-of-battle ship should be fitted with means of defence against torpedoes," &c.

(2.) "Every fighting ship should be fitted with two very fast steam torpedo quarter-boats," &c.

(3.) "Every fighting line-of-battle ship should have a torpedo tender, a vessel of two to four hundred tons, in which nothing but speed and turning power and torpedo fittings have been considered," &c., &c.

(4.) "As regards the defence of the line-of-battle ship, it would be the duty of the small steamers to keep boats from coming too close."

(5.) "It is difficult to say how useful these boats may prove. My impression is, that they would be invaluable and most destructive to the enemy. The hotter the action and the greater the confusion, the more it would be necessary to use the small boats, and in the hands of cool and practised Officers, there is no saying the mischief they might not do," &c., &c.

Fifteen years have elapsed since the above paragraphs were written, mostly spent in the flagships of the Flying, Channel, and Mediterranean Squadrons; where I have been enabled to witness their gradual development, which has now reached a point where, it seems to me, a systematic organization somewhat on the lines proposed in this paper (or on some probably better ones suggested in discussion) has become of vital importance.

The same idea was brought prominently forward in 1876 by Sir N. Barnaby at the Institution of Naval Architects, who was quoted in this theatre by Commander Gallwey in his paper on "The Use of Torpedoes in War," where he states that "it was approved by the highest authorities and variously quoted as an indispensable necessity for a modern fleet of ironclads." And in discussing that paper Captain FitzGerald made out a strong case in favour of exercising with adjuncts and auxiliaries where he states: "It appears to me that a squadron conducted on the principle of our present ironclad squadrons, simply by themselves, exercising with masts and sails, &c., does not represent the real study of the science of the art of war. A squadron of ironclads alone no more represents a fighting fleet than a large mass of heavy cavalry would represent an army, without artillery, infantry, engineers, telegraph corps, commissariat, and the other branches which are absolutely necessary to it," &c., &c.

Moreover, practically the torpedo flotilla under my command at Milford last year was much impeded and warded off by the 1st class boats of the Channel Squadron.

I therefore disclaim any pretension to create new theories, or to lay down any system of attack or defence; but only to prepare, organize, and exercise, on practical lines, which appear to me best suited to the ever-changing times.

#### *Imperial Organization of the Navy.*

There is a tendency to speak of the British Fleet as a whole. This is quite wrong and misleading; and I for one should like to see the practice discontinued. The talented author of "The Great Naval War, 1887," sends the fleet on a wild goose chase, and leaves the country rather at the mercy of the foe. In a great naval war there probably would be a particular command upon which the country would place greater reliance than on the remainder, but it should be outside and independent of the force for the safe protection of our shores. Both in the past and present we have always had numerous bodies of ships sometimes called squadrons, sometimes fleets, which composed the Navy; so that without proposing any radical change, I may suggest that we should have a definite number of divisions and squadrons, and one or two fleets, "fixed and fitted for use," their nomenclature depending on their numerical strength in units. Thus, as hereafter explained, a division would consist of three units under a Rear-Admiral or Commodore; a squadron six units under a senior Rear- or Vice-Admiral; and a fleet twelve units under an Admiral; each unit, division, squadron, or fleet having its told-off adjuncts and auxiliaries as shown in the diagrams; and a distinct letter, number, or other designating sign of its own, which should be carried by all the component parts belonging to it.

The Imperial organization of the Navy might then consist of the following as a minimum of what should be absolutely ready, prepared in every detail for a sudden declaration of war:—

A	Commissioned reserve..	Two squadrons, fleet of...	12	27 first class
B	Mediterranean .....	Squadron and division ...	9	mastless
C	Channel .....	Squadron .....	6	rams.
D	West Indies.....	Squadron .....	6	
E	Pacific .....	Division .....	3	28 first and
F	Australian .....	Division .....	3	second class
G	East Indies .....	Division .....	3	ironclads or
H	China .....	Squadron and division ...	9	cruisers as
I	S.E. coast of America .	Unit .....	1	most
K	Cape and W. Coast....	Division .....	3	suitable.
L	First and second class cruisers.			
M	Armed merchant steamers.			
N	Convoy.			
O	Obsolete for sacrificing.			
P	First class laid up reserve, ready for sea, 1 to every division afloat.			
Q	Building.			
R	Remainder in reserve.			
S	Imperial troop ships.			
T	Transports on hire.			
V	Ocean volunteer ships.			
X				
Y	Colonial force.			

### *Composition and Exercise Past and Present.*

Speaking of the fleets and squadrons of the past, they consisted, as everybody knows, of a certain number of line-of-battle ships, fire and store ships, with a proportion of frigates for lookout and outside work.

Their whole business in action, besides loading and firing, consisted in the management of the sails, shifting damaged spars, and repairing damaged rigging, thereby giving their exercises aloft a vital importance which the introduction of steam as a motive power lessened very considerably, and the absence of yards and sails has now done away with altogether.

As their very existence depended on their smartness aloft, regular and systematic drills were organized, taking place every evening at sea, and on especially told-off forenoons in harbour; and these drills were very naturally considered, as far as the fighting power of the fleet was concerned, to equal, if not to exceed, in importance, the gunnery exercises.

We read of the ships composing the Mediterranean fleet in harbour thinking nothing of "In boom-boats," "Striking lower yards and topmasts," "Run in lower-deck guns," every evening; "Crossing royal yards," "Out boom-boats," and "Run out lower deck-guns" at 8 A.M.

This was merely the morning and evening evolution, besides the usual routine, and at sea keeping station, and the necessary shortening or making sail, reefing, tacking, or wearing, all of which was gradually perfecting the fighting powers of the ships, developing the muscles of the ships' companies, and with the cleaning of the ship and boats, very properly taking up the greater part of the time of the Officers and men.

What I wish particularly to call your attention to is that though these old drills and exercises are obsolete, and of no possible use to the development of the fighting power of any ship, they are kept up with the same exactitude and earnestness as though the fate of the ship still depended upon them.

At the same time innumerable new duties have sprung into existence, and systematic instruction, in subjects little dreamed of by our forefathers, has become imperative. Constant additions are gradually being made to the fleet routine, and little or nothing is condemned and rooted out.

"Look alive and get the main-topsail shifted, so as to rig the boats for countermining before dinner," and "Get the torpedoes ready for running in the afternoon." "Mind and unrig net defence in time to have the top-gallant masts and yards ready for the 8 o'clock evolution." It would never do to hoist the colours without "the royal yards across, and the sails must be loosed to dry, and remember to have the 200 men for musketry at the range by 9, and the submarine mining class at the stores, and the steamboats for tactics, and the divisional drills, especially the newly raised and backward men aloft, and furl sails at 11," and so on, *ad lib.*, the new treading on the heels of the old with unceasing energy, while the old clings to the Service with a grip that seems as yet unshaken.

In 1882 I gave in this theatre the detail of the then existing routine of a fleet ship which still holds good, and has been reprinted for the illustration of this paper; and I entered fully into the question of Masted v. Mastless Ironclads, maintaining that we ought to try and keep up exercise aloft as long as we had to man sailing cruisers, and I argued that, where large bodies of men are to be confined on board mastless ships, a substitute for exercise aloft must be found in some form or another.

Since then I have had the honour of serving as second in command for over three years in a masted ironclad, where the exercise aloft had to be kept up to the letter, sometimes shorthanded, our marines being some months at Suakin, and four Lieutenants and the greater part of the captains of tops and upper yardmen being up the Nile for a considerable period.

In addition, the want of new drills was felt to a greater extent every day, and they were introduced; the result being that I had the conviction forced upon me, that the time had come when yards, sails, and drill aloft must go for good and all, in a fleet ship.

And why? Not on account of any question as to propulsion; not because there is a predominating opinion against the necessity for this particular kind of gymnasium; not because the yards and rigging would be most frightfully in the way in action. All of these are good enough reasons in themselves; but because the whole energy and time of the Officers and men of a fleet ship must be entirely devoted to the gun, ram, and torpedo; to submarine mining and sub-aqueous machines, and to the minor training in detail for personal attack and defence; besides the maintenance of the cleanliness and smart appearance of the ship and boats, which, owing to the increase

in the cleaning area of the former, and numbers, size, and care required for the latter, together with the reduction in complement, caused by the decreased numerical armament, and increased facilities for loading, training, &c., has become a serious nut for the second in command to crack. If the proposed routine be carried out, and the ship kept clean and smart as an efficient fighting base, there will be plenty to employ all hands without sail drill.

Such is pretty nearly the state of things up to date, but every day brings us nearer to the inevitable mastless fleet ship. Already the rapid change in the composition of the force in the Mediterranean is most marked, and it is satisfactory to note the gradual relief of the masted ironclads, and to consider the tactical power of the "Dreadnought," "Agamemnon," "Colossus," "Thunderer," "Polyphemus," &c., a powerful base in themselves with a very large body of trained Officers and men. It is for them and for similar vessels that I have ventured to draw out the routine for discussion to-day.

In the Channel we have trained Officers and men, but at present no mastless fleet ship.

There may still be a few of my brother Officers who cling to the idea that the police work can be done more economically under sail in peace-time, and that consequently drill aloft should continue wherever possible; but I should be very much surprised to find one who did not hold the opinion "that in a fleet ship they are simply sinful," and I do not hesitate to add "impossible."

#### *The Composition of the Future.*

As long as a fleet could be considered efficient where the ship proper with her complement of boats, hoisted up and inboard, was the unit, there was more elasticity with reference to its size and power which could be augmented or diminished at will by simply adding or taking away a ship. And the only question was the getting together of so many vessels with their guns and rams to form a fighting fleet.

But every day the reasons for adjuncts and auxiliaries are forcing themselves upon us; and their existence renders a new and systematic composition imperative. And this composition must be considered and organized, both for war and for peace; first for war, as we exist for no other purpose than to be so ready that peace shall be secured; and, secondly, for peace, as there is nothing gained by wearing out the material, as long as you be certain that it is there handy for war.

I propose to-day to deal with the composition of a fleet prepared for immediate action, and I hold that all divisions, squadrons, or fleets should be so prepared at all times; the component parts, "parent," "children," adjunct or auxiliary, for opposition to the hostile force, from whatever quarter it may come, being complete and prepared as a whole, so as to be ready for immediate muster at a given rendezvous.

That the means by which such a desirable end may be obtained are



now in full swing, is a fact upon which the country, and especially those who have the fearful responsibility of directing the progress of naval administration, cannot receive too much congratulation.

What I wish to combat in the early stage is the idea that 2, 4, 6, 8, or any number of ironclads form a fighting fleet, which I may safely state is generally accepted by the outside public; and I wish to prove that second only in importance to the parent ship, are the children which she will have to man, fit out, command, feed, and generally protect and look after, with the assistance of the attendant coal, store, depôt, and hospital ships.

I will now endeavour to lay before you what I believe to be absolutely necessary in the composition of the fleet of the future.

First, then, as to its numerical strength in units; I maintain that the time has gone by during which it was of paramount importance to mass a very large number of ships together, and therefore I propose to give to the term "fleet" a definite numerical value and strength, which should certainly not exceed twelve units with their auxiliaries, and I cannot conceive any concatenation of circumstances which would render it advisable to have a larger number acting as one body in an action on the open sea.

Taking the available vessels into consideration, and looking to facts as they stand, I am convinced that the best numerical organization for Great Britain at the present time is the divisions of three, forming squadrons of six, joining two of these squadrons, with their adjuncts and auxiliaries, if it became necessary to throw an overwhelming force on a given spot.

I would strictly adhere to the division of three under a Commodore or Rear-Admiral, as the first grade of superior responsibility; so that you could have 3, 6, 9, or 12, each with its own component parts, as shown in the diagrams.

Every station should be capable of forming a division, squadron, or larger force in its own ground, and they should be so formed—adjuncts included—(or such as it is not convenient to commission, accounted for, and proved to be ready if wanted), at least once in every twelve months.

The type of fleet ship might differ on the various stations, but the principle would remain the same.

In the Channel, Mediterranean, and commissioned reserve forces, I would have none but mastless turret or battery rams of the highest known speed and handiness, and the most piercing gun power.

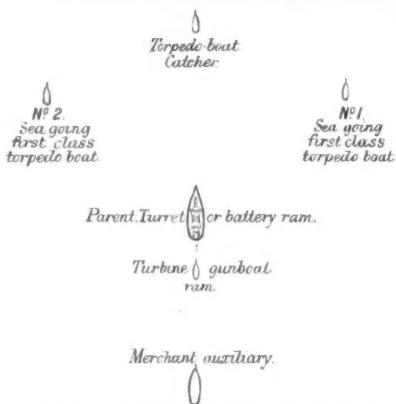
Thus we should have within reach of each other, and at no great distance from home, nine divisions organized in two, three, and four divisions respectively, either to act separately and independently, or to co-operate; fully equipped and exercised, absolutely prepared for an immediate outbreak of war.

#### *The Composition of the Future Fleet Unit.*

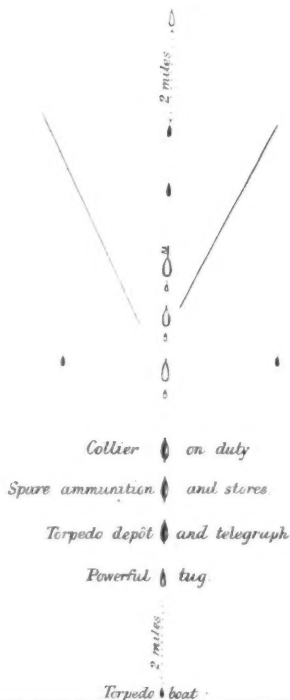
Having then proposed the number of units that should form a



# PROPOSED FLEET, UNIT



## A DIVISION.



# A COMPL

Port advance  
look out.  
Torpedo-boat  
catcher.

N° VI  
Torpedo boat

N° V  
Torpedo boat.

## II DIVISION.

Flag of 2<sup>nd</sup> in Command.

N° II<sup>nd</sup> Parent Turret or Battery ram.

N° IV  
Gunboat ram.

Port  
look out.  
Torpedo-  
boat-  
catcher

N° X  
Torpedo-  
boat

N° IX  
Torpedo-boat

N° V Turret Turret or  
Battery ram.

N° V Gunboat ram.

N° VI Parent Turret or  
Battery ram

N° VI Gunboat ram.

Telegraph cable ship

Torpedo store Dépôt. Hospital

Powerful tug N° II.  
Hydrants and  
pumping power

Two co  
carry  
solid

N° XII  
Torpedo boat.

Rear look out

# A COMPLETE SQUADRON.

Torpedo-boat catcher.  
look out ahead.

2 miles

Nº II  
Torpedo boat.

Nº I  
Torpedo boat.

Starboard  
advance look out

Torpedo-boat-  
catcher.

Nº IV  
Torpedo boat.

Nº III  
Torpedo boat.

## I DIVISION.

Flag of Commander in Chief

Turret or  
Battery ram Nº I Parent

Nº I  
Gunboat ram.

Starboard  
look out.

Nº VII  
Torpedo boat.

Nº VIII  
Torpedo-  
boat.

Torpedo-  
boat-  
catcher.

Turret or  
Battery ram Nº II Parent

Nº II  
Gunboat ram.

Turret or  
Battery ram Nº III Parent

Nº III  
Gunboat ram.

Course of the Squadron.

VISION.

in Command.

Turret or  
Battery ram.

IV  
boat ram.

or  
ram.

Turret or  
Battery ram.

at  
ram.

store  
Depot.

Hospital ship.

General store ship  
timber, caissons,  
etc.

Spare notes for boom defence.  
Steel wire hammers etc.

Spare ammunition  
ship on duty.

Two colliers on duty  
carrying 3000 tons each  
solid or liquid fuel.

Powerful tug Nº I  
Hydrants and  
pumping power  
Towing fire ships etc.

2 miles

Rear look-out. Torpedo boat catcher.

Nº XI  
Torpedo boat.

Powerful tug.

Nº 2 Collier  
Solid or liquid

Nº 2 Torpedo

Nº 2 General

Nº 2 Spare ammunition

Nº 2 Telegraph

Nº 2 Hospital

Powerful tug

Nº 4 Collier

# A COMPLETE FLEET

2 miles

## Parent Ships Mastless Rams.

N<sup>o</sup> 7  
N<sup>o</sup> 8  
N<sup>o</sup> 9  
N<sup>o</sup> 10  
N<sup>o</sup> 11  
N<sup>o</sup> 12

N<sup>o</sup> 1  
N<sup>o</sup> 2  
N<sup>o</sup> 3  
N<sup>o</sup> 4  
N<sup>o</sup> 5  
N<sup>o</sup> 6

Powerful tug

Adjuncts

Powerful tug

N<sup>o</sup> 2 Collier 3000 tons.  
Solid or liquid fuel

N<sup>o</sup> 1 Collier 3000 tons.  
Solid or liquid fuel

N<sup>o</sup> 2 Torpedo depot.

N<sup>o</sup> 1 Torpedo depot.

N<sup>o</sup> 2 General store ship

N<sup>o</sup> 1 General store ship

N<sup>o</sup> 2 Spare ammunition ship.

N<sup>o</sup> 1 Spare ammunition ship

N<sup>o</sup> 2 Telegraph construction

N<sup>o</sup> 1 Telegraph construction

N<sup>o</sup> 2 Hospital ship

N<sup>o</sup> 1 Hospital ship

Powerful tug

N<sup>o</sup> 4 Collier 3000 tons  
Solid or liquid fuel

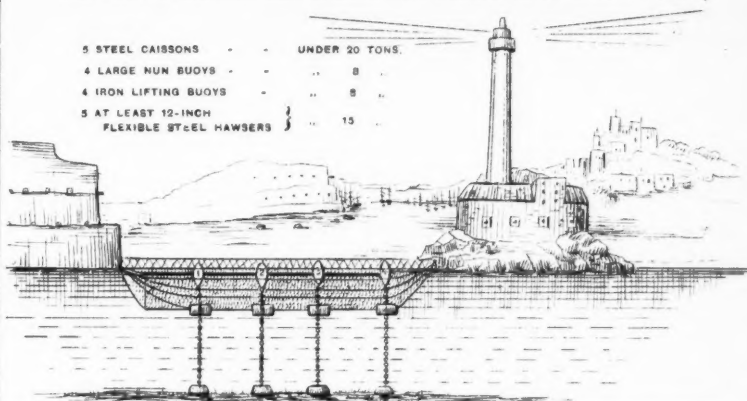
N<sup>o</sup> 3 Collier 3000 tons  
Solid or liquid fuel

Powerful tug

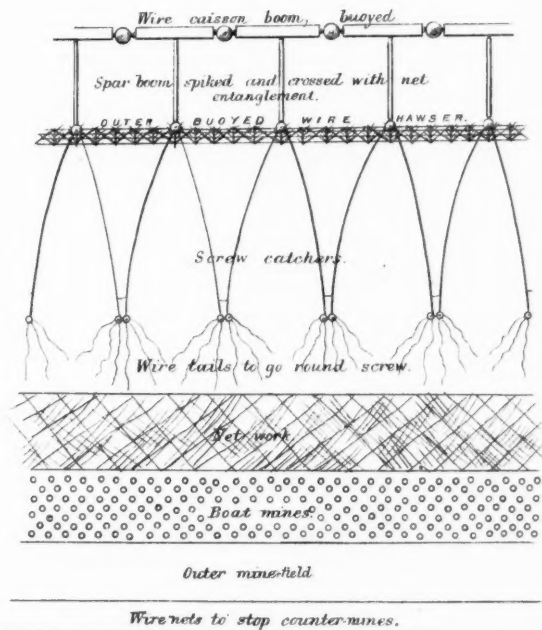
2 miles

**ROUGH SKETCH OF PROPOSED BOOM.**  
**NUN BUOY, CAISSON AND WIRE HAWSERS WITH TORPEDO NETS LACED TO THEM.**

5 STEEL CAISSONS	UNDER 20 TONS.
4 LARGE NUN BUOYS	8
4 IRON LIFTING BUOYS	8
5 AT LEAST 12-INCH FLEXIBLE STEEL HAWSERS	15



**INNER OR MAIN MINE-FIELD OBSERVATIONS AND CONTACT.**





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division, squadron, and fleet, I would now venture to lay down the least I consider these units should consist of.

First. As a basis, a first class turret or battery ram, with only sufficient masts for the purposes of semaphoring and elevated machine-gun fire; or as near an approximation to it as can be obtained. She should be fitted with the electric light throughout, masthead semaphores, complete net or other defence, &c., with one ram, guns, and torpedoes according to her carrying power, two second class torpedo-boats of the latest pattern hoisted inboard, and two or more subaqueous boats, when perfected.

Secondly. At least two first class sea-going torpedo-boats capable of keeping the sea in all weathers, commanded by two of her Lieutenants, and manned by crews belonging to her complement.

Thirdly. A fast turbine gunboat ram; very handy, to accompany her, as a rule in tow, fitted with search light and mine-removing apparatus, commanded and manned as before.

Fourth. A very fast at least 200-ton turnabout torpedo-boat catcher, destroyer, and look-out vessel, fitted with the latest improvements in torpedo discharge and machine-gun fire, commanded and manned as before.

Each of these adjuncts or children should be part and parcel of herself, considered as part of her armament and building expense, being laid up or not during her commissions according to the convenience or exigencies of the Service. Their Officers and crews being on the parents' books, would live, work, and train in her when not out for exercise, and as they would draw all their stores, provisions, &c., through the parent, only one set of non-combatants would be wanted for a complete fleet unit; the base supplying the wants of the component parts in every detail. When with the division, and especially after the declaration of war, they would be inseparable, the unit Captain being responsible for everything connected with them to the divisional Commodore.

Every three units or parent ships should have definitely belonging to them and told off for their sole use the following auxiliaries:—

First. Two well found and specially fitted colliers, capable of carrying 3,000 tons of coal each; one of which would be on duty with the division, while the other was at the coaling depôt filling up. These colliers will not be able to be snatched up haphazard on the spur of the moment, but after their special fittings, shoots, hatches, and winches have passed a rigid inspection, they should be told off, lettered, or numbered, as before stated, and their Captains given some insight into the manner in which a large force is moved on the open sea. Speaking generally, there would never be less than 1,000 tons present with the force for each fleet unit, or its equivalent in liquid fuel.

Secondly. A very large merchant steamer with great speed and cargo capacity to act as "general store" and "spare ammunition" ship, carrying boom gear, spare shot, shell, &c.

Thirdly. A torpedo depôt and telegraph construction ship, with half the fitters from the squadron torpedo depôt, carrying automatic

torpedoes and electric cables, &c.; also a powerful tug, fitted with extreme pumping power, hydrants, and armed with machine-guns, and a divisional hospital ship. This force would thus form a complete division under a Commodore, or a Rear-Admiral—if you could spare one.

The composition of a squadron under a senior Rear- or Vice-Admiral would allow of its being a little more complete.

First. Four colliers of 3,000 tons capacity, two always with the squadron, having the same qualifications as before mentioned.

Secondly. A fast torpedo depôt ship of large coal and cargo capacity, and 2nd class boat-carrying power, with various mines and "spare automatic torpedoes."

Third. A fast "general store, timber, and caisson ship," carrying all gear ready fitted, connected with the laying of booms, and six mining launches.

Fourth. A fast spare ammunition ship having on board a proportion of projectiles of the calibre of each unit. She should have large capacity, as owing to greatly increased weight and decreased reserve of buoyancy the limit to the ammunition carrying power of the fleet ship will be severely felt in the future; and I look upon the spare ammunition ship as next only in importance to the collier. Take, for instance, the latest launched fleet ship "Victoria," with a combined metal and powder discharge of 2,700 lbs. per heavy gun; she would require ammunition handy after bombardment or prolonged fleet action. The spare ammunition ship should carry six lighters.

Fifth. A large "liner" or P. and O., fitted as a hospital ship, carrying the red cross by day and in the presence of the enemy the electric cross by night, whose special duty would be to take on board all badly wounded and fever cases; and also to pick up the crews of any ships that may happen to be rammed, blown up, or set fire to, &c.; she should have numerous steam hospital boats at her davits, and a divisional tender.

Sixth. A telegraph construction and electric cable ship for tapping, laying, and picking up cables, &c. She should also carry in her tanks cables of all sizes required for submarine mining.

And, lastly, two powerful tugs fitted as before. It will thus be seen that for every parent, or base unit, there will be at least two 1st class torpedo-boats, two 2nd class torpedo-boats, two subaqueous boats (when perfected), one torpedo-boat catcher, or look-out, one turbine gunboat ram, and one large merchant auxiliary.

A fleet would consist of two complete squadrons, and would thus have a force of 12 fleet ships, 24 1st and 24 2nd class torpedo-boats, besides depôt boats, 12 catchers, 12 gunboat rams, 14 large merchant auxiliaries, and 4 powerful tugs (besides the despatch vessels present and running and provision ships working to and from the station depôt), capable of changing its scene of operation at a high speed.

In addition to the adjuncts for defence, an attacking torpedo flotilla will be required, to work independently as a separate command. They would travel in charge of and defend the auxiliaries, one, two, or three to each, according to the numerical strength of the flotilla.

Anyone who wishes to command a larger force in or out of action must have a good digestion. But should it be necessary to do so, this composition can go any length, and you can mass two or more fleets complete. A captive balloon in the flagship of the Commander-in-Chief might, on a clear day, enable your signal staff to count them. In my opinion the tendency in the immediate future will be to increase the adjuncts and decrease the number of parents.

*Organization, Command, and Responsibility.*

Fleet organization, I take it, simply means the distribution of your force in the most compact form, and marking the grades of command and responsibility at distinct points.

For instance, in the proposed fleet the Lieutenants or Warrant Officers in command of adjuncts would be responsible to their Captain; he, in his turn, being responsible for them, and all connected with his unit, to the divisional Commodore; who in turn would be responsible to the squadron Vice-Admiral for everything connected with his division; who would again be responsible to the Commander-in-Chief for his squadron, the Commander-in-Chief being responsible to the Admiralty and the country; directing and inspecting, but not actively interfering with the work allotted to the subheads.

I have marked the first grade of ulterior responsibility at three units by the presence and command of a superior Officer. In the naval force of the future I would never have a Captain in command of a division without giving him, if only temporarily, the rank of Commodore.

To meet the demand you would probably have to create the permanent rank of Commodore, to take the place of the present first fifty Captains, for which any Post Captain who had served a specified time in command of a ship of war at sea would be eligible to be selected for distinguished service, such as the destruction of any part of the enemy's force, &c.; and again Commodores, after a specified time in command of a division, might be selected for the Rear-Admiral's list on the same grounds. In the event of war some such plan as this will be wanted, or the Rear-Admiral's list largely augmented; probably the latter. Most likely other and better plans will occur to many present. I would only lay the rule of three down rigidly, as to the composition of a division of units with their adjuncts and auxiliaries, but most certainly leave it in the hands of the Commander-in-Chief as to how the force should be distributed for action.

I wish to be very explicit about this point, and to place a wide gulf between the composition of the division, squadron, or fleet, and its organization for actual fight.

The first should be definitely laid down and prepared long beforehand—is probably preparing now—but to the Admiral in command must be left the manipulation of the force for which he is responsible to the country. He may have a fancy for pairs, groups, indented lines of units, may have one form one day, and another form another day, in fact, he must be free!

We have yet to learn the most suitable and successful formation for attack and defence, but what we do know, and may predict with some certainty, is that the division, squadron, or fleet which is exercised and perfect in all known systems, and can rapidly change from one formation to another, has the best chance of winning an action.

Therefore I wish it to be clearly understood that I do not presume to advocate any system of group, pair, or other organization, but I do advocate a thorough knowledge of them all. Of course it must also be left to the Commander-in-Chief as to what force he shall detach for minor operations; he may find it convenient to send a parent without her children, or with her first class boats only, or with extra boats in any number; but in all cases the division or squadron to which the parent belongs should supply or keep the difference. The departmental organization places the force in the Admiral's hands, after that they cannot be tied in any way. I am convinced that the division of three under a superior Officer, call it or him what you will, is the best basis of organization for your main and auxiliary force, ready for immediate rendezvous.

#### HARBOUR ROUTINE (OLD).

##### A.M. SUMMER.

- 4.40—Call boatswain's mates, corporals, and mates of decks.
- 4.45—Hands.
- 4.50—Hands fall in, scrub upper deck.
- Duty boats' crews clean out.
- 5.45—Hammock stowers, royal yardmen, and boys, lash up and stow, royal yardmen clean conductors, spread awnings.
- 6.0—Lash up and stow.
- 6.10—Steerage hammock men, watch below fall in, sound reveillé.
- 6.15—Cooks, up guard and steerage hammocks, bathe.
- 6.30—Breakfast.
- 7.0—Forenoon watch to clean in blue working dress, duty men and boats' crews in rig of the day.
- Watch below clean main deck and flats.
- 7.15—Watch and duty boats' crews fall in, clean bright work, if top-gallant masts are down overhaul top-gallant rigging.
- 7.50—Upper yardmen fall in, up all wet deck clothes.
- 8.0—Evolution, then quarters clean guns.
- 8.35—Mondays and Wednesdays clean pump gear.
- 8.50—Return rags.
- 8.55—Disperse, hands to clean.

##### A.M. WINTER.

- 5.10—Call boatswain's mates, corporals, and mates of deck.
- 5.15—Lash up and stow.
- 5.30—Cooks.
- 5.45—Breakfast.
- 6.15—Hands to clean in blue working rig.
- 6.25—Bath watches fall in, clean upper deck, upper yardmen clean lightning conductors, duty boat's crew clean out, up guard and steerage hammocks.
- 7.0—Watch below clean main deck and flats, watch dry upper deck, coil down ropes.
- 7.15—Overhaul top-gallant rigging if top-gallant masts are down.
- 7.50—Upper yardmen fall in.
- 8.0—Evolution, then quarters, clean guns.
- 8.35—Clean arms Tuesdays and Thursdays, clean pump gear Mondays and Wednesdays.
- 8.50—Return arms or rags.
- 8.55—Hands to clean.
- 9.10—Roll, sweepers.
- 9.15—Quarters.
- 9.45—Watch drill.
- 10.0—Watch fall in, drills as ordered.
- 11.0—Cook's watch below, up spirits.
- 11.30—Clear up decks.
- 12.0—Dinner.

## A.M. SUMMER.

- 9.10—Roll, sweepers.
- 9.20—Quarters, prayers.
- 9.45—Watch drill.
- 10.0—Drills as ordered.
- 11.0—Cooks, watch below, up spirits.
- 11.30—Clear up decks.
- 12.0—Dinner.

## P.M.

- 1.25—Roll, sweepers.
- 1.30—Watch fall in.
- 3.0—Watch drill.
- 3.50—Upper yardmen fall in.
- 4.0—Evolution, quarters.
- 4.15—Cooks, shift into night clothing.
- 4.30—Supper.
- 5.0—Both watches fall in, furl awnings, coil up ropes.
- 5.30—Bathe, up boats not required.
- 7.10—Steerage hammock men fall in.
- 7.15—Stand by guard and steerage hammocks.
- 7.30—Stand by hammocks.
- 8.30—Clear up main deck.
- 9.0—Out pipes, rounds.
- 9.30—Pipe down.

## P.M. WINTER.

- 1.15—Roll, sweepers.
- 1.20—Watch fall in.
- 3.0—Watch drill.
- 3.50—Upper yardmen fall in.
- 4.0—Evolution, quarters, coil up ropes.
- 4.30—Cooks.
- 4.45—Supper.

## TUESDAY AND THURSDAY.

*Routine for Small Arms.*

## A.M.

- 8.40—Return rags.
- 8.45—Hands to clean.
- 9.0—Clean arms.
- 9.10—Roll, sweepers.
- 9.15—G. put belts or return arms.
- 9.20—Quarters.

## FRIDAY.

A quarter of an hour is to be given for cleaning guns, then pump gear. Clean guns after quarters.

## SUNDAYS.

## SUMMER AND WINTER (PAST, PRESENT, AND FUTURE).

## A.M.

- 5.30—Lash up and stow.
- 5.45—Cooks.
- 6.0—Breakfast.
- 6.25—Steerage hammock men fall in. Revellé.
- 6.30—Up guard and steerage hammocks, hands to clean in blue working rig, duty men in rig of the day.
- 6.45—Watch below clean main deck, watch fall in, clean upper deck as ordered, then wood and bright work, duty boats' crews lower and clean out.
- 7.30—Duty boats' crews to clean.

## A.M.

- 7.50—Quarters, clean guns.
  - 8.30—Disperse hands to clean.
  - 8.50—Roll, watch fall in, clear up decks for divisions.
  - 9.30—Divisions, Divine Service.
- P.M.
- 3.50—Roll, sweepers.
  - 4.0—Quarters.
  - 4.15—Cook's hands shift into night clothing.
  - 4.30—Supper.
  - 5.0—Coil up ropes.

If awnings are to be spread lash up at 5.15, spread awning at 5.30, furl at 5 P.M.

## SEA ROUTINE (OLD).

**A.M. SUMMER.**  
 3.30—Coil up ropes.  
 4.0—Scrub decks.  
 5.45—Re-set sails, &c.  
 6.0—Spread awnings, hammock stowers, royal yardmen, and boys lash up.  
 6.15—Lash up and stow, royal yardmen clean lightning conductors.  
 6.25—Steerage hammock men fall in.  
 6.30—Reveillé, cooks, up guard and steerage hammocks.  
 6.45—Breakfast.  
 7.15—Watch below clean lower deck, watch clean in blue working dress, duty men in rig of the day.  
 7.30—Watch fall in, stations, clean bright work.  
 8.0—Quarters, clean guns.  
 8.30—Clean pump gear on Mondays and Wednesdays.  
 8.40—Return rags.  
 8.45—Disperse, hands to clean.  
 8.55—Roll, sweepers.  
 9.0—Quarters, prayers.  
 9.30—Watch drill.  
 9.45—Drills as ordered.  
 11.30—Clear up decks.  
 12.0—Dinner.  
**P.M.**  
 1.25—Roll, sweepers.  
 1.30—Watch fall in, drills as ordered.  
 3.0—Watch drill.  
 3.45—Clear up decks, watch below shift into night clothing.  
 4.0—Cooks shift into night clothing.  
 4.15—Supper.  
 4.45—Roll, both watches furl awnings.  
 5.0—Quarters, evolution.  
 7.10—Steerage hammock men fall in.  
 7.15—Down guard and steerage hammocks.  
 7.30—Stand by hammocks.  
 8.30—Rounds.

**A.M. WINTER.**  
 3.30—Coil up ropes.  
 4.0—Scrub decks.  
 6.0—Hammock stowers, royal yardmen, and boys, lash up.  
 6.15—Lash up and stow.  
 6.25—Steerage hammock men fall in.  
 6.30—Reveillé, cooks, up guard and steerage hammocks.  
 6.45—Breakfast.  
 7.15—Watch below clean lower deck, watch clean in blue working dress, duty men in rig of the day.  
 7.30—Watch fall in, re-set sails, clean wood and bright work.  
 8.0—Quarters, clean guns.  
 8.25—Clean arms.  
 8.35—Return rags.  
 8.40—Disperse, hands to clean.  
 8.50—Roll, sweepers.  
 9.0—Quarters, prayers.  
 9.30—Watch drill.  
 9.45—Drills as ordered.  
 11.30—Clear up decks.  
 12.0—Dinner.  
**P.M.**  
 1.15—Roll, sweepers.  
 1.20—Watch fall in, drills as ordered.  
 3.0—Watch drill.  
 3.30—Shift into night clothing.  
 3.50—Roll, sweepers.  
 4.0—Quarters, evolution, cooks, supper.  
 7.10—Steerage hammock men fall in.  
 7.15—Down guard and steerage hammocks.  
 7.30—Stand by hammocks.  
 8.30—Rounds.

**TUESDAY AND THURSDAY.***Routine for Small Arms.*

**A.M.**  
 8.25—Return rags.  
 8.30—Hands to clean.  
 8.45—Clean arms.  
 8.50—G. put belts on, or return arms.  
 8.55—Roll, sweepers.  
 9.0—Quarters.

**FRIDAY.**

A quarter of an hour only to clean guns, then pump gear. Clean guns after.



## WEEKLY ROUTINE (OLD).

## MONDAYS.

A.M.

Air bedding.

8.0—Cross upper yards.

9.0—Lash up or inspect bedding.

9.45—General exercise aloft.

3.0—Watch drill.

4.0—Down royal yards, evening  
quarters, wash clothes, alter-  
nate weeks scrub hammocks.

## TUESDAY.

5.30—Lash up and stow.

5.45—Up, scrub hammocks.

6.0—Spread awnings.

8.0—Cross royal yards.

9.45—Watch drill.

4.0—Down top-gallant masts, even-  
ing quarters.

## WEDNESDAY.

7.45—Overhaul top-gallant rigging.

8.0—Cross royal yards, loose sails.

9.45—Watch drill.

11.15—Furl sails.

3.0—Watch drill.

4.0—Down top-gallant masts, even-  
ing quarters.

## THURSDAY.

P.M.

7.15—Overhaul top-gallant rigging.

8.0—Cross royal yards.

9.30—Landing party.

10.15—Marines.

11.15—Furl sails.

4.0—Down royal yards, evening  
quarters, wash clothes.

## FRIDAY.

7.15—Cross royal yards.

8.0—Prepare for action.

9.45—General quarters.

11.15—Cross royal yards, down upper  
yards.

P.M.—Scrub canvas gear, up yards, &amp;c.

## SATURDAY.

3.0—Up, clean hammocks, alternate  
weeks.4.0—Mend furl of sails, evening  
quarters.

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*NOTE:—On Tuesdays in Winter.*

6.25—Up, scrub hammocks.

*Proposed New Weekly Routine Turret Fleet (Harbour).*

	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
A.M.						
4 or 5 to 7.50	Clean ship, men, and boats.	Clean ship, men, and boats.	Clean ship, men, and boats.	Air bedding, clean ship, men, and boats.	Clean ship, men, and boats.	Clean ship throughout.
8.0 ....	Fire a torpedo.	—	—	—	—	—
8.0 ....	Clean guns and small arms, and pump gear.	Clean guns and small arms.	Clean guns and small arms and pump gear.	Clean guns and small arms.	Clean guns and small arms.	Do.
9.0 ....	Morning quarters, inspection, prayers, and stand easy.	—	Morning quarters, inspection, prayers, stand easy.	—	Morning quarters, prayers, stand easy.	Prayers.
9.10 ...	—	Morning quarters, inspect men and arms, prayers, stand easy.	—	Morning quarters, inspect bedding, lash up and stow, prayers, stand easy.	—	—
9.40 ...	Out net defence, furl and restow nets, classes of the watch.	Small arm companies by company leaders, marines heavy gun, then classes as on Monday, p.m.	General quarters, with day boat attack, combined or separate, twice a month.	Landing party, complete, stokers, &c. Land alternate Thursdays with marines.	Prepare for action. Net defence, and 1st class boat attack once a month. Collision mats. Clean guns and decks.	Clean ship and guns.
11.30 ...	Clear up decks	Clear up decks.	Clear up decks.	Clear up decks.	Clear up decks.	—
Noon ...	Dinner.	Dinner.	Dinner.	Dinner.	Dinner.	Dinner.

Saturday.

Friday.

Thursday.

	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
P.M. 1.15...	Fall in, mining, signal, rifle, cutlass, pistol, knotting, splicing, and cable joining. Heavy, machine and field gun classes. Compass, lead, &c.	Fall in, lay out an anchor or fire engine, or prepare to tow or be towed, then classes as on Monday.	Fall in, classes as on Monday, P.M. — Boat tactics.	Make and mend clothes. Leave, &c. Gymnasium open.	Fall in, classes as on Monday, P.M. Scrub canvas gear. Boat tactics.	Fall in, clean bright work.
3.30...	Clear up decks.	Clear up decks.	Clear up decks.	Clear up decks.	Clear up decks.	—
4.0....	Evening quarters.	Evening quarters.	Evening quarters.	Evening quarters.	Evening quarters.	Evening quarters.
4.30...	Supper, leave, gymnasium, and pulling boats' crews.	Supper, leave, gymnasium, pulling in boats.	Supper, leave, gymnasium, pulling in boats.	Supper, gymnasium.	Supper, gymnasium, pulling boats' crews.	—
5.0....	Wash clothes, alternate weeks scrub hammocks.	—	—	8.30 exercise a regular system of night patrols by boats, in connection with the exercise.	—	—
9.0....	Watch night signals.	Watch night signals.	Watch night signals.	Day men at signal exercise.	—	—

*Every two Months, Weather and Circumstances Permitting.*

1st Week.—Lay and raise a combined minefield, assisted by torpedo depot ship.

2nd Week.—Build a boom, assisted by general store ship. Attack and defend it at night. Gunboats, torpedo, and guard boats.

3rd Week.—Night attack by boats on squadron or fleet. Electric light defence by gunboats. Lay caissons or pontoons and nets to protect auxiliaries.

4th Week.—Countermine a dummy minefield, clear a passage and raise.

## PROPOSED NEW HARBOUR DAILY ROUTINE.

- | A.M.  | SUMMER.   | A.M.  | WINTER.  |
|-------|---|-------|--|
| 4.30  | Call boatswain's mates, &c.   | 5.10  | Call boatswain's mates, &c.  |
| 4.45  | Hands.  | 5.15  | Lash up and stow.  |
| 4.50  | Hands fall in, scrub upper deck.<br>Duty boats' crews clean out.  | 5.30  | Cooks.   |
| 5.45  | Hammock stowers and boys lash up, spread awnings.   | 5.45  | Breakfast.   |
| 6.0   | Lash up and stow.   | 6.15  | Hands to clean in blue W. R.   |
| 6.10  | Steerage hammock men fall in, sound reveillé.   | 6.25  | Both watches fall in, clean upper deck, duty boats' crews clean out, up guard and steerage hammocks.   |
| 6.15  | Cooks, up guard and steerage hammocks, bathe.   | 7.0   | Watch below clean main deck and flats, watch dry up, &c.   |
| 7.0   | Forenoon watch clean in blue working dress, duty men and boats' crews in rig of the day. Watch below clean main deck and flats. | 8.0   | Colours, quarters clean guns.  |
| 7.15  | Watch and duty boats' crews fall in, clean bright work.   | 8.35  | Clean arms Tuesdays and Thursdays, pump gear Mondays and Wednesdays.   |
| 7.50  | Up all wet deck clothes.  | 8.50  | Return arms or rags.   |
| 8.0   | Colours, quarters clean guns and small arms Tuesdays, Thursdays.  | 8.55  | Hands to clean.  |
| 8.35  | Mondays and Wednesdays clean pump gear.   | 9.10  | Roll, sweepers.  |
| 8.55  | Disperse, hands to clean.   | 9.15  | Quarters, prayers; stand easy.   |
| 9.10  | Roll, sweepers.   | 9.45  | Fall in, general exercise or drills as ordered, classes, &c.   |
| 9.15  | Quarters, prayers; stand easy.  | 11.0  | Cooks, watch below, up spirits.  |
| 9.45  | General exercise and drills as ordered.   | 11.30 | Clear up decks.  |
| 11.0  | Cooks, watch below, up spirits.   | 12.0  | Dinner.  |
| 11.30 | Clear up decks.   | P.M.  |  |
| 12.0  | Dinner.   | 1.15  | Roll, sweepers.  |
| P.M.  |   | 1.20  | Fall in, drills and classes.   |
| 1.20  | Roll, sweepers.   | 4.0   | Evening quarters.  |
| 1.25  | Quarters then fall in.  | 4.30  | Cooks' supper, leave, gymnasium, pulling boats' crews, up boats.   |
| 1.30  | Drills and classes as ordered.  | 7.10  | Steerage hammock men fall in, 7.15 guard and steerage hammocks, 7.30 stand by hammocks, 8.30 clear up decks, 9.0 out pipes, rounds, signal exercise. |
| 4.0   | Quarters.   |       |  |
| 4.15  | Cooks, shift into night clothing.   |       |  |
| 4.30  | Supper.   |       |  |
| 5.0   | Furl awnings, bathe, up boats, voluntary gymnastics, and pulling boats' crews, leave.   |       |  |
| 7.10  | Steerage hammock men fall in.   |       |  |
| 7.15  | Stand by guard and steerage hammocks.   |       |  |
| 7.30  | Stand by hammocks.  |       |  |
| 8.30  | Clear up main deck.   |       |  |
| 9.0   | Out pipes, rounds, signal exercise.   |       |  |
| 9.30  | Pipe down.  |       |  |

## TUESDAYS AND THURSDAYS.

*Routine for Small Arms.*

- A.M.
- 8.30—Return rags.
- 8.35—Hands to clean.
- 8.50—Clean arms.
- 9.5—Roll, sweepers, on belts.
- 9.10—Quarters inspect and return arms, prayers, &c.

*Peace Routine and Exercises.*

The smartness, order, and also the comfort of every force, no matter of what it is composed, depends almost entirely on its system of routine and exercises, the arrangement of which should insure that

the largest possible number are at all times receiving the utmost amount of instruction and benefit from exercises that will be of the greatest use to them when they have to assist in the numerous and different kinds of operations which the Royal and Mercantile Navy will be called upon to perform in any war sufficiently serious to endanger the safety of this Empire, and at the same time bringing no heavy strain on any body of men or portion of time.

Having stated that yards and sails are sinful and impossible in a fleet ship, I propose to give the whole of the time and care that has till now been bestowed on them to the "Excellent" and "Cambridge," "Vernon" and "Defiance," and to the signal and tactical school which is at present an unknown quantity; but which I venture to predict will yet have a place in our training system.

The necessary supply of men for such vessels as are still fitted with sail power must be trained in the brigs and training squadron, or in the sailing sloop especially attached for that purpose; no time can be allotted in the turret fleet routine for that training.

The nature of the required instruction having more of an educational character, points to the development of the training class system, and assimilating the drills to the school courses.

It is quite clear that the schools cannot supply the force in commission with a full complement of trained seamen gunners and torpedo men; nor is it at all necessary that they should. But they can and do supply a sufficient number for instructional purposes.

So that in the same way that the old line-of-battle ships fitted out with probably only a fourth of their crew who had ever been to sea before, and had to make seamen of them all in the shortest possible time; the fleet ship of to-day will have to start with as many seaman gunner torpedo men and marine artillery miners as can be spared, and these will instruct every man on board during the commission. There is not the slightest reason why any amount of men may not be trained as S.G.T. in the fleet on the same lines that they are trained in the schools. Let the rating of acting S.G.T. be open to all, and lay down your routine and drills, with a view to giving all hands the best chance of becoming so.

#### *Weekly Routine in Harbour.*

In these divisions and squadrons the criterion of smartness and efficiency will be the time taken to lay a minefield, build a boom, out and in net defence, countermine a channel, instead of up and down masts and yards, shifting topsails, &c.

In the Particular Service Force a torpedo was fired at 8 A.M. before cleaning guns, but with ships continually together, once a week would be ample for this exercise, and I propose Monday morning.

Then during the forenoon let "net defence" take the place of general exercise aloft, and in the afternoon, and whenever there is no general exercise, let there be a definite and well understood system of training classes in heavy, field, and machine-gun drill, submarine mining, rifle drill, cutlass exercise, signals, knotting and

splicing, electric cable joint making, compass, lead, wheel, and gymnastics. Every seaman, stoker, and marine on board should go through all these classes.

On Tuesdays the small arm companies should be exercised on board by their leaders, and on Thursday landing party complete. Where the nature of the port will admit they should be landed for exercise, field and machine-guns included, alternately with the marines, at least once a month, and brigaded once a quarter.

On Wednesdays short general quarters, with boats away for boat attack every alternate Wednesday.

On Fridays prepare for action in every detail, having a first class boat attack once a month.

Both Officers and men should go through a systematic training in boat evolutions in their turn, on Wednesday and Friday afternoons, or even more frequently in convenient harbours, concluding with ramming drill.

The usual practice in laying out anchors, landing fire engines, preparing to tow, or be towed, could take place on Tuesday afternoons; and a complete and regular system of guard-boat patrol, as it will be required during war, should be organized and exercised on Thursday nights, after make and mend clothes day, and during the night signal exercise of the daymen and yeomen.

There should be a complete gymnasium on board every fleet ship, horizontal bar, clubs, dumb bells, &c., open to all after working hours.

Besides the weekly routine, where the weather and the nature of the service will permit, every two months should contain a record of combined work, approximating as nearly as possible to what we shall have to do in the event of war.

1st week. Lay, test and raise a complete minefield.

2nd week. Build a boom. Attack and defend it at night, using gun-boats, guard-boats, &c.

3rd week. Night attack by all available torpedo-boats, on the force at anchor, electric light defence by gunboats. Auxiliaries, if present, defended by caissons or pontoons and nets.

4th week. Countermine a dummy minefield, clear a channel, and raise.

These exercises should be carried out at least six times during the year; and once a year, half the station force should attack the other in harbour.

This routine would be the guide and basis for the exercises of the fleet, squadron, or division, subject to the invariable etceteras of coaling, provisioning, docking, general leave, &c.

#### *At Sea.*

With the proposed number of attendant gunboats and catchers on the station, the parent ships would not necessarily be much at sea.

The Officers and signalmen could go out in turn in the gunboats under one of the Admirals or Commodores, accompanied or not by the 1st or 2nd class boats, and learn all the signal-book detail, evolutions, &c., having been previously put through the preliminary by the Flag Captains in the steam pinnaces.

But when at sea, "general quarters," "preparing for action," company drill, landing party, and the class drills would be the same as for harbour.

The time of the Captain and the executive Officers not on special duty during the day would be taken up with tactical manœuvres, and also the crews of the 1st class boats if in company. A glance at the diagram will show that practice will be wanted for the catchers and boats, and for whatever auxiliaries may be out; though with well-trained and prepared Officers a week or two should be ample.

It will be absolutely necessary to exercise the divisions or squadrons, if you have them, in passing through one another at close quarters, with their advance guard of catchers, centre support, and rear guard-boats, and after a little practice they should fire blank while doing so; and again, night exercise with and without lights, and with a system of signals based upon the minimum display of light, and no fire-works.

No exercise which can accustom the parents, adjuncts, and auxiliaries to move in concert and carry out previously planned combined operations, can be too often gone through. It is the seamanship of the future; and if it be certain, as I believe—and every one seems to argue—that we shall be enveloped in smoke from beginning to end, then exercise in smoke!

Lieutenant Sturdee in his prize essay<sup>1</sup> speaks of the Russian Fleet being divided into two portions, one of which attacks the other with all the vigour of real war, and suggests the same for our own force. I am entirely of the same opinion, and I firmly believe that it is one of the very few roads, and the most direct, towards the elucidation of those vital naval questions which are crowding on us with ever-increasing rapidity, and it would be a crowning effort in that tactical education for our Officers and men, which for years I have done myself the honour of advocating, both in this theatre and elsewhere, with all the fervour at my command.

At least once a year, and for a period of not less than a month, the whole station force should muster and go to sea for exercise. During this time, the manœuvres cannot be made too real, and even risks must be run in order to insure high tactical training and skill.

The certainty of the superior Officers being killed in the early part of an action, and the probability of ships being sunk or disabled, leads to the establishment of a system of filling up casualties (as at gun drill) both in ships and Officers.

To make it entirely chance work the names of the ships, Admirals, Commodores, and Captains, and name or rating of all commissioned

<sup>1</sup> Journal, No. 134.



Officers, should be painted on tallies, and placed in a bag on the poop of the flag-ship.

During combined manœuvres and general quarters, they should constantly be drawn, and ordered off duty by signal, the next in command taking the place of his superior, and if he should be the senior executive left, becoming responsible for everything connected with the ship.

The Commander-in-Chief would take his turn with the rest, and, when drawn, the flag-ship would have to take a subordinate station, her place being filled by the second in command, an organized close up taking place amongst the remainder. If a divisional leader were drawn, the close up would of course only affect his division, the second taking command and temporary rank.

Weather permitting, the force should constantly be exercised in filling up with coal at sea; and the colliers should all be fitted with shoots, to shoot the coal on to the decks of the parent vessels.

The 2nd class boats might be hoisted out, exercised in skirmishing and screw fouling, and hoisted in; once a week on the most suitable day. In connection with this exercise, I may remark that the present system of derricks is hardly suitable; and I should like to see cranes which would lift the boats and place them in the water. The above would be a guide to the routine at sea, with the addition of the necessary target practice, dummy torpedo-boat, and prize firing, &c.

#### *System of Look-out.*

There cannot be two opinions as to the importance of a systematic and dependable look out by torpedo-boat catchers and boats both by day and night, and also their manipulation on a considerable change of course, reversing, &c.

We have not far to seek for the reason for a look-out, ahead, on both sides, and in rear. From the high speed of the attacking boats in comparison with the normal speed of a cruising or blockading force, it is in their power to rush in from any quarter, presumably the most unexpected quarter; therefore, in your system of look-out, you must be careful to cover the largest possible arc on all points of the compass. In the conquest of Great Britain in 1888, Captain G., who destroys the British Fleet, observes that they are protected with cruisers to the south, east, and north to prevent a surprise; but to the westward are unprotected, and therefore attacks from that quarter—of course in a properly organized division, squadron, or fleet—the proposition is absurd.

Each parent should have its own catchers and boats on its own line of look-out, according to its station. Leaders ahead, centre ships the sides, and rear ships the quarters and astern. On reversing temporarily, positions need not alter, and the rear would become leading look-out; but if permanent, an executive signal would cause the boats to resume their normal relative stations.

*Rapid Commissioning.*

Another feature of the future of our naval strength in divisions, squadrons, and fleets will be the rapid commissioning of parents and adjuncts and the short time it will take to get a complete unit to sea. Let us suppose a 1st class turret or battery ram in the first division of the reserve of the future. Her 1st class boats, catcher, and gunboat will be in close proximity to her; 2nd class boats inboard. Her Commander or Navigating Lieutenant, Chief Engineer, Warrant Officers, and permanent artificers on board, together with her coal, stores, mess traps, &c. The trained nucleus of her complement would come from the force in commission, and the main body will have been made capable of performing their duty and fighting the ship in harbour drill-ships, or in batteries on shore, and they would only have to pick up their sea legs, and accustom themselves to the ship, when called out and embarked.

There seems no reason why a laid up unit, division, or squadron, should not put to sea on an emergency, if all your preparations were cut and dried, in less than twelve hours after the telegram has been received to fit them out.

*Complement.*

With an economical arrangement, considering the rapid growth of mechanism, it does not appear that the complement of a complete unit need greatly exceed that of the fleet ship of the present, the increase being in artificers and reliable coxswains. We have already such a large and daily increasing number of specialists amongst the Officers and men that we are gradually creating a class, consisting of those who have no letter tacked on to their name, and who are becoming known as "General Service Officers and men." This class will prove most valuable, and though not considered competent to instruct in special subjects, they should be smart and well up in all kinds of gunnery, capable of laying and working a mine-field, making a boom, management of 1st class boats, &c., &c.; but especially in handling large ships, singly, or in any number, communication by signal, general organization, and in fact they are the seamen, whose only business is the seamanship of the new school.

I have long thought that all marines should gradually become "marine artillery miners," and I believe there now exists a consensus of opinion in favour of so simple a change.

Complements would thus commence with a proportion of specialists, and the remainder, General Service Officers and men, all of whom would be trained as specialists during the commission.

For instance, a "parent fleet ship" would carry (roughly)—

<i>Officers.</i>		<i>Men.</i>	
Captain (special or general service) .	1	Special P.O.'s and coxswains.....	30
Commanders, special .....	1	"    A.B.'s .....	20
"    general service.....	1	General service, boats, &c. ....	180
"    navigating .....	1	Marine artillery .....	80
Lieutenants, special .....	6	Marine artillery miners .....	20
"    general service .....	4	Signal P.O.'s.....	10
Engineers, special.....	6	2nd and 3rd class signalmen and	
"    general service.....	6	boys .....	20
Medical department.....	4	Mechanics and stokers .....	120
Pay department .....	4	Domestics, cooks, &c. ....	20
Marine artillery, special 2, general 1	3		
Warrant officers, special .....	6	Total .....	500
"    "    general service ...	12		
Total .....	55		

The above would officer and man the 1st and 2nd class torpedo-boats, torpedo catcher, and gunboat, the special Commander looking after the adjuncts and the special outside work, the general service Commander the ship, and the navigating Commander the safe conduct, stores, &c.

A division would thus require three units, at  $554 = 1,662$ .

A squadron " " six " " = 3,324.

A fleet " " twelve " " = 6,648.

And allowing 100 all told for each auxiliary, would bring the total to—

A division	..	..	1,662.
A squadron	..	..	3,924.
A fleet	..	..	7,848.

With the service of the flags, the proposed "fleet" may be said to require 8,000 Officers and men.

In the above estimate of complement I am presupposing increased mechanical appliances and the principle that we shall put "as few eggs into one basket" as we can possibly do.

### *Boom Defence.*

I have referred to the building of a boom as part of the fleet exercise, and I have prepared a diagram (see Plate) in order to explain what I mean. By itself it is not intended to keep an ironclad in check, but it undoubtedly would stop boats and give a gunboat considerable difficulty. I claim for it, that it is easy to put together, and that all gear, hawsers, moorings, &c., connected with it can be carried in the general store ship. Being in sections, each unit of the force present would place its own share and assist to reeve the hawsers.

It was planned with the idea of defending the entrance to the Grand Harbour, Valetta; but since then, I am told, the experiments at Bantry Bay have clearly proved that a naval force should carry with it a ready-made boom, in sections, capable of being quickly laid and removed, which would at least stop torpedo-boats, delay gunboats, and

could be quickly repaired. It seems to me that this would meet those requirements, but of course it has not yet had a trial and is fairly open to your criticism. It consists of caissons or pontoons connected by large cellular built nun buoys, spreading six of the largest made flexible steel wire hawsers, interlaced with small short steel wire, and spread with torpedo wire nets specially carried by the store ship for that purpose; the moorings and central weight being supported by large buoys between 1 and 2 fathoms below water.

A light framework floats on its danger side, to keep off boats; and wire hawsers, especially fitted with tails, to catch the screws of attacking gunboats, would be buoyed out in the direction from which the attacking force would have to approach.

Besides defending the entrance of a harbour, or round the auxiliaries inside, it might be laid to stop torpedo-boats coming out of a blockaded port.

### *Conclusion.*

In conclusion, I beg to point out that no one can regret more than I do that we cannot carry all we require on one keel; and to some it may be a matter of regret that our wants cannot be carried in ships whose Officers and men belong to the Royal Navy; but we have to deal with facts, and that we shall have a number of component parts, Royal, Reserve, or Volunteer, working together under sub-heads, who again are acting under a supreme director and organizer, is a fact which is brought home to those who study the subject, especially those who have recent experience with a large naval force. And in addition to what has been suggested, what does this mean?

It means an increased necessity for a highly trained and efficient signal staff, capable of insuring constant communication by day and night, between the Commander-in-Chief, leaders of squadrons, divisions, parents, adjuncts, and auxiliaries.

It means, as Sir Donald Currie pointed out years ago in a most valuable paper on "Maritime Warfare, &c."—"preparation long before wanted!"<sup>1</sup>

It means "that a combined systematic organization of our gigantic Royal and mercantile naval resources is imperative!" And from what we hear, we may assume that it is making rapid progress.

And above all it means an enormous "ocean volunteer force," for which ships, Officers, and men of all sea-going mail or trading companies should be eligible, with depot battalions consisting of boatmen, fishermen, and in fact our sea-going population of every class and denomination; rivalling the defenders of our hearths and homes in numbers and efficiency, and transforming a glaring weakness, fearful to contemplate, into a pillar of strength fit to support the traditional renown of the British Empire, whose ever-growing power has lain in the daring with which her mariners, whether employed by Royal or merchant owners, have crossed the pathless ocean.

A great deal has been said about the loss of nerve and the conse-

<sup>1</sup> See Journal, No. 89.

quent deterioration of the seamen; but I agree with Captain Fitzgerald, that "we may still have risky exercises."

It is clear that in actual war there will be quite an exhilarating atmosphere of risk, requiring highly tempered steel nerve.

"Gopčević" states, as lessons from his battles, during the "conquest of Great Britain of 1888"—

"That the one ramming runs great risk if other opponents are near at hand."

"Torpedoes are dangerous to friend as well as to foe;" and I think he is not far off the mark when he concludes, that "the victor in a naval action nowadays must suffer as heavy losses as the vanquished."

One thing is clear: that should we be called upon to meet the enemies of our gracious Queen, it can only be by definite organization and by perfecting the whole of our vast naval resources in such exercises as I have humbly endeavoured to advocate, that we can make certain of finding "in the darkness, smoke, and confusion of future naval battles, midst deafening explosions, outrivalling the cannon's roar, and the crash of the charging masses, as they hurl themselves on one another in one mighty effort of destruction, struggling for the very existence of their homes and country," that our ships are possessed of that unity which is strength, and our Officers and men that knowledge which is power.

To my mind, it is not so much the deterioration of the British seaman we have to think of. You may develop his intellect and educate him without fear; and if systematic instruction in gymnastics be carried out, he will lose little of his muscular power. No. Take the yards and sails. In the attainment of the only object for which we exist, they are useless; and in the "interior economy of a modern fleet in time of war, they must prove disastrous."

Leave only a boathook on which to hoist the Union Jack, and depend upon it when the time comes, its spots of glory will rival those of past ages; or it will wrap itself as a shroud round the ships and crews who may yet go down with their colours flying!

The CHAIRMAN (Admiral Wills): Before the discussion commences Captain Campbell has asked me to read a letter from Lord Charles Beresford, with his remarks upon the paper. It is like all he generally says, very much to the purpose and terse.

*Extracts from a Letter to the Lecturer from Lord Charles Beresford, M.P., unavoidably absent at Yarmouth with H.R.H. the Prince of Wales.*

1. I congratulate you on your paper: the pith of it is excellent. I wish I could have come to say a few words in support of many of your ideas!

2. Your "composition" for fleets and squadrons is sound, good, and necessary!

3. You wish for "systematic organization"—so wise. In other words you want to teach Officers and men what they will have to do in time of war—before they are called upon to do it.

4. Practise "condition and organization" in working fleets and boats at high speeds! Get rid of the ridiculous hamper and useless lumber of masts and yards which invite an accident to your screw and so risk losing an action you otherwise would have won to a certainty!

5. Constant drill under steam will allow our Commanding Officers to understand how to carry out a sudden change of formation which might win them the action.

6. We are getting on, but *oh!* so slowly.

Signed, &c.,

CHARLES BERESFORD.

Rear-Admiral Hon. E. FREMANTLE: I did not come here this afternoon with the intention of saying much, if indeed I said anything at all, but as there seems to be some reluctance to commence the discussion, I am very glad to say a few words. I have had the pleasure of reading the lecture before I came here, and have done so with very great interest. I am quite sure many of the points which Captain Campbell has made will approve themselves to all here present. We must all allow that the general idea of a fleet consisting solely of half-a-dozen ironclads, or a dozen ironclads, is to a great extent an exploded one; a point I made very strongly about a year ago in this theatre. We have always found it necessary in former times to have considerable adjuncts to the fleet. We know that Nelson said when in search of the French Fleet before the Battle of the Nile, that the word "frigates" would be found written on his heart, because he could not get his look-out ships. These look-out ships are far more necessary now than they were then. We know too in the Russian War how necessary it was to have fleets of colliers, and what trouble they gave from their being sailing vessels and not able to follow the fleet; but now it is still more necessary as our fleets are to depend entirely upon steam power. Under these circumstances the colliers undoubtedly become more necessary. Then we have the question of ammunition. We know that at the time of the bombardment of Alexandria our ships were short of ammunition, and there would have been great difficulty in continuing the bombardment, that in fact we could not have had another day's fighting on the same scale, and the ammunition reserve was called up in a great hurry from Malta and Gibraltar. Consequently we must see the necessity of having ammunition ships as well as colliers. Our ships cannot carry a very large number of rounds per gun, and there is a tendency to reduce the number still further. I need not refer to the points in illustration of this given by the lecturer. When a vessel discharges at each broadside a shot of a ton weight, we must see clearly that a further necessity has arrived for having ammunition ships. I will go a little further and mention also with regard to the question of booms and nets which are required, that if we are to do away with masts and yards which came in comparatively handy to form a boom such as was made at Berehaven, we shall have to trust to the ammunition vessel for booms and nets and spare gear which make the impediments of which we form the boom. We know also how useful the "Hecla" was in keeping the torpedo-boats in order during the operations in Egypt. We want in fact a very large factory to accompany our ships. The object of the lecturer is that these things should be distinctly recognized beforehand, so that we shall not suddenly on the outburst of war find out that these adjuncts to a modern fleet are necessary and have to provide them in hot haste. When we come to the question of torpedo-boats, and the adjuncts for war, it becomes absolutely necessary that we shall have them prepared beforehand. That takes me to the question of the fleet unit. I think, admitting the principle of the lecturer that there must be some adjuncts, it will be admitted that the adjuncts for fighting purposes may vary. Some part is left by the lecturer somewhat to our imagination. We see the turbine ram is mentioned to accompany the parent ship. Now, no doubt, if Sir George Elliot were here, he would be extremely angry at anybody throwing any doubt upon the success of the turbine principle in warfare; still at all events it has not proved itself hitherto a factor on which we can rely, and therefore the lecturer has drawn to a certain extent on what he thinks may be possible for the future rather than what is possible in the present. I think I may fairly express some regret that he did not confine himself to what is existing. However, to go to the question of the unit, I think on the whole the unit is very well worked out. We want certainly some sort of store ship, some sort of torpedo catcher, and certainly first-class torpedo-boats if possible, to accompany every parent ship. Then we come to the question whether it will be advisable to make them so much distinctly the children of the parents as they appear to be in his

plan. He has got vessels which are practically what I should call tenders of the parent ship. I think he has put it exceedingly well, because as I understand there is one Commander expressly told off to look after the tenders, and who will no doubt have the responsibility for them entirely, of course under the Captain of the parent ship. I think that is extremely necessary if we are to have them as tenders in the way the lecturer suggests. I have had some experience with tenders. When I commanded a ship in the north I had five tenders. I do not know whether any of the three Commanders who I had the honour of serving under me during 2½ years of my command are present. They were all extremely good men and have, I am glad to say, all become Post-Captains since, but I do not think they had quite that parental interest in and regard for the well-being of the tenders which I had myself, and it would have been a great assistance if I had had a Commander who would have assisted in keeping them in order and the crews complete. I only mention that as some objection to the parent system of making all these vessels as tenders, although there is a great deal which has been urged by the lecturer on the other side. Now we come to the question of drill, and the lecturer tells us it will be an extremely good thing to do away with drill aloft, because he says there is great pressure. There is a certain paragraph in which he gives a not very exaggerated view of what he had to carry out as Commander of the "Alexandra," when I knew her in Malta Harbour. We had to carry out a great many drills and exercises aloft, while at the same time under the Commander-in-Chief's orders we had very properly a very large amount of torpedo drill and torpedo-boat work, and none of the new things gradually growing up were neglected. The lecturer speaks feelingly of the difficulty he has felt in combining all this work, and in that I entirely agree. At that period I commanded a turret ship, and I have often been asked whether we found any difficulty in employing the men. Certainly in the early stages of their commission we found we had always plenty for them to do; the boat drills, torpedo drills, landing drill, gunnery drill, net exercises, and so on gave us plenty to do, and as I am quite certain, although that ship is in commission now, and it is a couple of years since I left her, that they have always found plenty to do. The fact is that torpedo drills and gunnery drills are more thoroughly attended to in a mastless ship, and on the whole they are more efficient. They were certainly more efficient in gunnery and torpedo drills in the "Dreadnought" than they are in the "Agincourt," the ship in which I am now serving, and I say that without wishing to throw the slightest imputation upon the excellent Gunnery and Torpedo Officers of the "Agincourt." When a ship has masts and yards, all the senior Officers especially, who have been brought up in that school will go back to their first love and feel most interest in drill aloft, it is such a satisfaction to them to see the masts and yards sent up in 1 minute 30 seconds or so. It looks so pretty to see the yards swing across as the ensign is hoisted at 8 o'clock, and the band plays "God save the Queen." Well, I regret to say that all that is pomp and show. I do not wish to speak of it disrespectfully, but I am afraid we must throw it all overboard as useless lumber. I should like to ask the lecturer what he refers to with regard to the second-class boats being exercised in fouling the screw. I entirely agree in what he says about second-class boats being hoisted out, that some easier method ought to be found than exists at present. I cannot understand why the engineering ingenuity of which we have so much in this country cannot favour us with something superior to the system we have now, by which a boat dangles from the derrick and swings about at the imminent risk of getting smashed. The only other point to which I specially wish to refer is that about signals. The lecturer, who has given great attention to this subject himself, being an accomplished Flag Lieutenant, tells us that he has had pertinently brought before him the difficulty that there is in getting sufficiently good assistance in the Signalling Department, and also that the school of tactics scarcely can be said to exist. In that I entirely agree. I may mention that there are some new signal books about to come out, which we had the pleasure of trying in the Channel Squadron. These new signal books are on a different system to a great extent to the old, that is, the endeavour has been made to use the semaphore more and fewer flags. That means a more complicated system in the receiving of signals, and we want a more experienced staff than we ever had before. The staff ought to be very much better than they are, and the



signalling Officers also very much more trained, otherwise we shall have great mistakes, and all our endeavours to make the Commander-in-Chief's orders and wishes easily made known to the fleet will be thrown away because the fleet will not be able to understand them. Under those circumstances it is very much to the point that the lecturer has told us that we must have a better tactical school, and that the Signal Department must be improved and augmented. I thank the lecturer very much for the lecture, but I may say in conclusion that I think two ships would make a better division than three.

Lieutenant JACKSON: As one who has lately served with Commander Campbell in a masted ironclad, I can fully testify that he has practised in actual work that which he has preached this afternoon, and I can also uphold his very graphic description of the number of different evolutions often required to be done at the same time, and the difficulty the Commanding Officer has to overcome in keeping both sails and the more modern requirements of a ship all in a high state of efficiency. One other point as regards the retention of sails in a modern ship is the question of stowage and weight. In masted ships when the stowage of sails, &c., is regarded as of primary importance, the stowage of the fighting material is often cramped, and the transporting arrangements rather deficient. These defects are entirely overcome in the mastless ironclads, when sail power has not to be considered. There is plenty of opportunity for smartness left in rigging booms and nets, but working both nets and sails together seems to me to be sure to lead to the neglect of one or the other, and that perhaps the most important of the two evolutions. As regards the different points raised in this interesting lecture, I would remark that our present experiences prove the necessity of a mother ship for first-class torpedo-boats to act as a base to the flotilla, the small quantity of stores, and the minor repairs so often required necessitating a frequent return to the dépôt. Captain Campbell says the boat should be a perfect sea-going boat, but I am afraid when we go into that, he will find that his sea-going torpedo-boat will be nearly as large as his torpedo-boat catcher. I think the plan of the mother ship will be found more efficient for cruising than attaching one or two boats to each ship, whose movements might be considerably hampered thereby, except in very fine weather. The ironclad forming the base of the unit also carries second-class boats, and she will have some torpedo-boats with her; and it is much to be hoped that the method of hoisting these boats out will be improved. The use of these second-class boats is very limited, as they are very dependent on the weather, a slight swell preventing them being hoisted out, and rendering them of not very great service when they are out. The attaching of a torpedo tender to each ship is very likely to form a most valuable addition to the fleet in war-time, as their great speed and better seaworthy qualities than the ordinary torpedo-boat will make them almost safe against the latter if they only have sea room, their speed allowing them to destroy each boat in detail. They would also be able to do the attacking duties of torpedo-boats in weather in which the latter would have lost most of their value. I think the number of "Rattlesnakes" might with advantage be increased. The question of the complements of modern ships is also a serious one in our vessels where the crews are reduced to the very smallest number possible compatible with working the guns. It is to be hoped that the time usually devoted to sail drill in masted ships for the non-combatants will now be used for training them in the use of arms, where it is sadly needed. As regards subaqueous boats, although they are being developed, I do not think one has yet been designed that will meet our requirements, and their sphere of action will, I think, always be very limited. They are, however, by no means to be despised, but at present their room on board an ironclad is of more value than their company. I would also place the turbine ram with its necessary slow speed in the division instead of the unit, and consider that she should be fitted as a miner and tender to the dépôt ship. As regards the seaman gunner torpedo men, the acting rating is now open to all A.B.'s, but they have to pass through the school ships to be confirmed, which I think is as it should be, as they get a much more advanced training than is possible at sea. With regard to the gymnasium, that is a very excellent institution on board. I can speak from practical experience. We have one now on board the "Vernon," which is crowded every evening with young men very anxious to be taught, and many of

whom it is simply impossible to tire out even by good gymnasts. It is a very popular form of amusement to them. With regard to the boom shown on the diagram, the only point I should like to raise is that there is no timber in it, which would render it possible to be destroyed by Whiteheads. I do not know where the nets go. If they are on the inner boom they would stand a very good chance of sinking the boom with the Whitehead fired at the nets, they would explode the Whitehead underneath the pontoons and so sink the boom. That is the only objection I can see to it.

Captain the Hon. THOMAS BRAND : I shall not keep you many moments, but there is one point which has not been touched upon by any of the speakers, and which I think is worth mentioning, and that is rather with regard to economy. I have no doubt Captain Campbell is putting forward what he thinks we ought to have in the Navy, but we must try to get on as far as possible with the means at our disposal, and it is almost unnecessary to add we are not likely to get more money voted for the Navy than we have at present. I should like Captain Campbell, if he gives us another lecture, to consider whether it is possible in an organization of this sort to have your parent ship manned sufficiently well for herself to be able to say that on calling out the reserves, the reserves might be put in the parent ship, and certain portions of her crew sent to the adjuncts, so that you would actually be keeping your fleet at a rather less expense in time of peace than you would in time of war ; for according to this paper you would have 32,000 men required for the fleet entirely outside anything in the way of protection of commerce. I was going to mention the turbine, but I need not do so as Admiral Fremantle has referred to it. I think it would be very hard upon an Admiral to say that the organization of the fleet on going into action is to be left entirely with him, because he is in a very curious position when he has all these ships to take care of behind him. I think he would have to send most of them away altogether. The difficulty would be that for certain purposes and at certain times you want different ships. If you are going to bombard you would want the ammunition and might not want the colliers, but if you are going to cruise you want the colliers but you would not want something else. It therefore seems to me very hard upon the Admiral to say that he is entirely responsible for manœuvring the whole of those ships. With regard to masts and sails I am entirely in accordance with Captain Campbell, and I should think it would be a most excellent thing if a little exercise in coaling at sea were occasionally carried out.

Captain W. H. HENDERSON, R.N. : On matters of principle, and as to the necessity for a higher form of organization than has hitherto existed, I quite agree with Captain Campbell, although on many points of detail I differ from him, but they are points open to discussion, and which can only be settled by experience, and the shaping of means to ends. In no case can additional money be expended, what can be done must be effected with existing conditions. The old times have gone by never to come back, it is necessary we should look at the new state of naval warfare straight in the face, and devote our energies only to essentials, to organization for war, and to the training of the rising generation of Officers and men in the naval operations and seamanship of the day ; all else involves loss of time, waste of strength and means, besides inviting disaster. I believe that naval developments are tending to assimilate operations at sea to operations on land, and that no naval force can be considered complete without its due proportion of the several elements representing the various types and classes of ships of the day ; any more than a military force is complete without its due proportion of infantry, cavalry, artillery, and engineers. I believe also that as the efficiency of an army depends on its "mobility," and its "mobility" in great part depends on the organization of its transport, so in the future will the mobility and consequent power of a naval force depend on the proper organization of its supplies ; whatever may be settled upon as the fleet unit, it should have its own definite proportion of transport. As an army must have bases, permanent and temporary, from which to draw its supplies, so in the future will the success of naval operations depend upon the manners and security of the bases, permanent and temporary, from which the fleet, squadron, division, or unit may be acting, and the ability to protect and keep open the necessary lines of communication. Each foreign station should have its pro-

portion of force told off for it, so that on the outbreak of war, be it a unit, division, squadron, or squadrons, it would be complete, and easily concentrated either for offensive or defensive purposes, all that it would require being additional Officers and men. The foreign dockyards and fortified coaling depôts being the main bases of the naval stations, should be capable of repairing and supplying the force told off to them, and the permanent auxiliaries attached to the strength of each station should without doubt be kept at these bases. I think the gunboat attached to each unit should have independent powers of locomotion, it would not do to trust to its being towed. We do not require our ships to be as much scattered as they used to be for police purposes, they can cover much more ground in less time than formerly; besides, the police duties now mainly exist on the traditions of the suppression of piracy, of the slave trade, and the protection of British subjects in unstable and not fully organized communities, duties which fell to our lot to perform and which necessitated a scattering of force, but which are now gradually disappearing and exist only here and there. The telegraph and good speed under steam are more efficient instruments in the hands of a Commander-in-Chief for meeting necessities of this sort as they arise. The squadrons on foreign stations may therefore be more concentrated and trained together for fighting purposes than has hitherto been the case, and if this were so would easily be able to look after and keep in order their smaller auxiliaries not kept permanently in commission. I protest against the idea that we require any special form of ship for police and cruising purposes in peace time, we want only fighting vessels, built without other thought or consideration, the smaller classes of which, with their superior speed and coal-carrying capacity, will do any cruising work that may be required, getting over the ground five times as fast and doing five times the work of any makeshift. In regard to the ammunition ships, I think it would be wiser not to put "all one's eggs into one basket" in this respect, and that it would be safer to fit the colliers to carry a proportion of ammunition and stores, which would not much reduce their coal-carrying capacity. Captain Campbell's paper really goes to the root of our training system, and the question is coming on for solution, whether both for Officers and men it should not be adapted to the actual requirements of the day, instead of attempting to inculcate and make the foundation of all professional knowledge, a passing form of seamanship which for practical purposes is extinct and can never be even artificially revived, leading to waste of money, time, and dissipation of energies, which would be more profitably diverted into the direct channels of the seamanship of the day, a much more difficult and complicated science. There is not the slightest fear of the instincts and characteristics of the sailor being lost, be the form of seamanship what it may, and the knowledge and nerve now demanded in the everyday work and life of a ship is much greater than that which was required for exercises and evolutions aloft, and which have now no purpose in them. I do not think that a gymnasium is even necessary, a blue-jacket's duties are too diverse, he has so many different forms of hard manual labour to perform, and will still have lots to do with ropes and boats ever to need the physical training of one. Rapid commissioning can only be efficiently carried out with a more thorough training of Officers and men in the handling and management of the various complicated internal fittings and arrangements of the many classes of modern ships that exist at present, otherwise an immense number of defects occur from ignorance and carelessness. Temporary commissions are from the same causes fruitful sources of unnecessary defects, and involve large sums for repairs; barracks are much wanted, and the men in the depôts should be told off as skeleton crews to the ships ready for service. Cruisers should be attached to the units, and Officers and men comprising a unit should all be trained in the management of the various descriptions of its components. It is our business and duty afloat to train Officers and men in the seamanship and fighting conditions of the day. This can easily be done, and the unit kept in a high state of training and efficiency, but it is not in a sea-going ship easy to find the time, for the systematic instruction which goes on in the gunnery and torpedo schools it must necessarily be too desultory to be thorough. I think the boys should be trained in rifle, cutlass, revolver, and heavy gun drills before coming to sea; I would abolish the rating of trained men, and open the rating of S.G.T. to all, making the course in

the gunnery ships shorter and sharper, and derating the pay of the trained men to the greater number of S.G.T.'s who would qualify. On return from foreign service every one should go through a qualifying or short re-qualifying gunnery course.

Rear-Admiral COLOMB: I find myself in agreement with many details of the lecture, and yet my mind is so constituted that it would be impossible for me to have approached the subject as Captain Campbell has approached it. I can never look upon the organization of our fleets apart from geographical questions. I cannot think for a moment how many ammunition ships, or store ships, or auxiliaries of any kind we require unless I have previously settled in what part of the world that fleet is going to act. I know quite well if we go to war with Russia we want one set of arrangements, if we go to war with China we want another set, and if we go to war with France we want another set. I cannot bring myself to say that any unit such as is proposed can ever be established in that way. But when you take it in the broader way and say, as my friend behind me has said, that we must act upon bases as a rule, then I think it is true, and that those bases must be properly furnished with the necessary auxiliaries. I think proportionate auxiliaries for the ships that we have is becoming a matter of considerable importance. I quite agree that we should prepare in peace-time regularly fitted colliers, regularly fitted torpedo vessels, regularly fitted ammunition ships. But to arrange them as a fleet, to say that a fleet is not complete unless she has so many of them, seems to me to be begging the question, because it will be complete or incomplete entirely according to the nature of the service on which that fleet is sent. I feel myself at sea in apportioning numbers or forming units in which such vessels are combined, because I cannot say that I want so many ironclads, so many torpedo-boats, unless I can just say exactly what I am going to do with them. I have not settled myself, I have not heard anybody yet who has settled it, and in my opinion till that is settled, numbers cannot be settled. Well, then, though I cannot approach the subject in the same way as the lecturer has done, and though I cannot settle it in my mind that we can by possibility start with a complete unit, and then aggregate it up to a squadron or a fleet, I know well that the feeling that such a necessity exists is very largely spread over the Navy, and I take it that there must be some defect in my own organization that prevents me from accepting the position as it is put before us to-day. But on the other hand, so much that the lecturer has said falls entirely into the way I think of these things, that I cannot but express my concurrence with him on those points where I do agree. I am delighted to see he restores to us once more the idea that we are not bound entirely to destroy, but that there is some chance that we shall do what we used to do, capture our enemies and bring them into port. Then when he speaks of the "Mammoth" and "Microbe," which I think are two capital names and will fix themselves in our ideas excellently, I agree with him there, but I do not think, whatever may be said by distinguished Officers over the water, that the "Microbe" is to take the place of the "Mammoth" yet. How the "Microbe" and "Mammoth" are to be mixed depends again chiefly on the question of what you are going to do with the "Microbe," how you are going to combine it with the "Mammoth." How that is to be done I am not prepared to say. I am more inclined to think the "Microbe" has its business, and that the "Mammoth" has her business, qualified by this, that it may be possibly true that the "Microbe" is to sweep the "Mammoth" off the sea. The hoisting out of torpedo-boats is one great question. Our ships are supplied with second-class torpedo-boats. I never can tell myself exactly how they are to be used. I feel certain that they cannot be used in ordinary fleet action, that is to say where the fleets meet in the open sea—sight each other 10 or 12 miles off at daylight—say—and approach one another. I cannot think of any fleet stopping to hoist out torpedo-boats, because it lays itself open to the attack of the other fleet, being found at slow speed. There may be some way of doing it. The idea of surrounding an ironclad with a number of auxiliary vessels was put forward by Sir Nathaniel Barnaby, and then I was in the same difficulty; I wanted to know exactly what the "Microbes" are going to do, and I cannot be satisfied that they are going to be there at all unless I am reasonably certain what their action is to be. I am delighted to hear the lecturer check the tendency to talk of the

"fleet" in the singular number instead of the plural "fleets." That idea of the "fleet" is altogether and always one of the most mischievous ideas that has at present found its place in the English mind. I am certain it has cost us enormous sums of money in fortifications, and no doubt it will cost us a great deal more still. The idea is dangerous that there is only one fleet, and that one fleet is to be destroyed, or misled, or taken away, and that the mischief is to follow. We shall have "fleets," and if one fleet comes to grief we shall always hope there will be another fleet to take its place. I do not quite agree with the lecturer when he speaks of fleets and squadrons of the past as if they had something like the organization which is shown to us to-day. My reading of history teaches me that it was an entire toss up what sort of auxiliaries a fleet of ships of the line had. I know of some cases where there was a small fleet and a very large number of frigates; I know of other cases such as the expedition under Lord Howe, off the Straits of Gibraltar, with, I think, thirty-four sail of the line and only one frigate. In our far back history, victuallers and store ships were common, and in the wars with the Dutch, and later, fire-ships as special weapons whose use was fully understood, accompanied the fleet. But there was no rule that I have ever been able to find about it. I strongly agree with the lecturer on the subject of exercises; I quite think that our men should be taught to fight and nothing else. Sail drill was a part of the fighting power in the old days, and was necessary for teaching as part of the fighting duty, but now that that is passed, the sooner we give it up and stick entirely to fighting powers the better. I was delighted with that other phrase that the lecturer has got hold of that "sails are sinful." I think that also is a phrase which will very likely carry its weight. There is another thing the lecturer has mentioned which I feel always strongly about, but as to which I am not quite sure that he has carried out the rule which he has laid down. He has told us the Admiral's discretion must be free. The thing we have to do is to give the Admiral every freedom, to take care not to tie his hands in any way whatever. But I should be afraid, that if you propose that he shall not have a ship without the auxiliaries, that you do in some sort tie his hands to begin with. I am glad to see the lecturer always uses the term "fleet ship." It is a capital term, and I have often said so. You never forget when you hear the word "fleet ship" used that that ship is to act in a fleet. I think the term "battle ship" has been a most atrocious and mischievous term. It means nothing, the consequence is the moment you begin to speak of a battle ship you begin to think of a ship which is wanted to do you know not what. But when you speak of a "fleet ship" you think of her as intended to act with other ships in concert. With regard to the smoke, we ought to study that question very carefully. I think the squadrons in the Channel and the Mediterranean ought to know thoroughly well what they can do and cannot do with smoke. We find the most opposite opinions as to what is the right and wrong way of dealing with the question. Sir Leopold M'Clintock, I think it was, an eye-witness of the fight between the Austrians and Danes off Heligoland, formed the opinion there that to get rid of the smoke you must fight to windward, and you must be to windward yourself to get the advantage. Commander Bainbridge Hoff, in "Modern Tactics," points out that to get clear of the smoke you ought to fight to leeward, because it is your own smoke which hurts you, not the enemy's. If you fight to leeward your smoke is blown from the mouth of your guns, your view is clear to windward; but if you, yourself, are to windward and the enemy to leeward, the bank of your own smoke floats gradually away and keeps an impenetrable veil between yourself and the enemy. Sham attacks are very important and ought to be carried out to a great extent, and I am sure from personal knowledge the destruction in sham of superior Officers is a very excellent exercise. I do not mean to say for the good of the Service,—of course it is for the good of the Service if real. I have commonly, I may say, almost regularly made arrangements for having myself killed, and the fighting tower shot away, or the navigator killed, and the Commander killed, and the fighting tower swept away. It used to be a regular formal exercise, first in simply killing the Captain and saying, "I am dead, go on, there's the next man." Then everybody in the ship began to put their heads together and to see under these different casualties how best they could communicate with the next in command, where best he could command the ship from, and how there would be the least delay in

filling up the place of the Captain. Strong stress, I think, may be laid on the improved organization and great increase of the signal staff. It is ridiculous to me to see the reports in the Army of what they think, and of the money they have spent, and the training their people undergo in this matter of signals. It is not one-fiftieth of the importance that it is to the Navy. Yet we in the Navy in all these years since our signal systems have been improved, have hardly taken any steps to increase or improve the signal staff, and now we are coming to that condition of things that all depends upon it. I do not see my way to an ocean volunteer force. I do see my way to a volunteer force which shall protect territorial waters, and I hope we shall get it, but as to an ocean volunteer force, I do not think that that is likely to be. I think the Naval Reserves, regularly paid by the State in times of peace, called on in times of war, may be very largely increased, but it will not be as volunteers that they will serve, although they may and I hope will serve in the territorial waters round the coast. On the question of ramming, I see that the German writer referred to by the lecturer has done us the honour of quoting what was pointed out here years ago, that the ship ramming runs great risk if other opponents are near at hand. I forget what we called it, but we had a name for it; the ship next to the ship likely to be rammed was her guard, and it is a very difficult thing to attempt to ram any one ship if another ship is placed in such a position as to be her guard.

Admiral BOYS: I beg firstly to observe that the lecture to-day has been given by a comparatively young Officer, and the discussion has been generally carried on by men about his standing. That I look upon as a very good sign of the interest taken in this Institution, and proves its utility. The Council are glad to find the junior Officers in the Services taking part in these discussions. With regard to the lecture itself I have very few words to say. My time afloat is over. It is, however, unquestionable that we ought to have some more recent description of organization than now exists, and something on the lines that have been so ably laid before us would probably meet our requirements; the only exception I should make to the proposed fleet organization is that I should cut out the turbine, because fleets now-a-days must proceed at high speed, and I do not believe that any turbine-propelled ship ever could attain the speed required. A great deal of stress has been laid upon the sail drill, &c., still carried on in masted ships. That point does not seem to bear very strongly upon the lecture, because, after all, we have very few ironclads that are masted. Is it the fact that crossing yards, making sail, shifting topsail yards, and so on, interferes with the fighting drill of the Service? I can hardly believe it myself; but, if it is so, I regret it very much. I still am of opinion that we cannot altogether take the masts and sails out of ships that are only fitted with single screws and single engines, and which have no auxiliary to depend upon, no reserve of mobility, except sail-power. I think we certainly should leave some sails in such vessels to drag them along in case of accident. One speaker has intimated that every man in the Fleet ought to be a seaman gunner or a torpedo-man; that is by no means a novel idea, but it is simply an impossibility. The seamen gunners and torpedo-men are all supposed to be to a certain extent instructors, and there are many men who cannot come to a sufficiently high standard of training to do the duties of these ratings, more especially to instruct other people. Whatever organization we may have to adopt, whatever training may be necessary, whatever we may have to meet in the future, all point to the necessity of continuous exercise and instruction in fleet manœuvres and tactics; and if, as is pointed out by the lecturer, the Admiral and Seniors of the Fleet must be killed, then somebody else must replace them. The juniors cannot gain the requisite experience in handling ships, &c., unless they are given the opportunity, and actually put in the position to do so.

The CHAIRMAN: I will just make one or two remarks before I ask the lecturer to answer the points that have been raised. Admiral Colomb has mentioned many on which I should otherwise have touched. There is, however, this, that if, as the lecturer says, the parent ship is to contain 500 men and 54 Officers, I think a great many of our turret ships at the present time would find considerable difficulty in accommodating those 500 men, and the 54 Officers would certainly not find sufficient cabin room. But that is only a minor detail, because the principal adjunct,



the largest ship of all carrying coal, or any other ship could easily carry the superfluous men and Officers which the parent ship could not accommodate; and I am not quite sure that the convenience of the smaller craft would not be better served by having their extra crews borne on board one of the large adjuncts. I quite agree with Admiral Colomb that every kind of service does not require the same kind of boat and adjuncts. One part of the paper to which I take exception is the necessity the lecturer finds in killing off the Admiral! I only hope his successor will fill his place efficiently and have better luck. I will now ask Captain Campbell to reply.

Captain CAMPBELL: There really is very little to be answered. The question of the turbine was raised in the paper merely with the view of introducing everything as late as I possibly could, and as modern. I must confess I thoroughly believe in the turbine, and I put the turbine there for mining work, clearing passages, &c., &c. I have put her in tow of the parent ship on purpose. When she is really wanted for work it does not much matter about the speed; she will be able to move about quite fast enough when engaged in removing mines, when it is more important that she should be unsinkable than fast. Admiral Fremantle asked about fouling the screw. It really means this, firing off as much blank cartridge as you like, wrapping the ship up in smoke, and then letting your two torpedo-boats see if they can foul your screw by hawsers or other contrivance. For years I have been an advocate for greater practice and care taken to fit ourselves for some operation that will foul the screw of our enemy, because the whole ship depends upon a thing that you have stuck outside. If you can get hold of that thing and stop it the ship is done for and dead, and is absolutely no more use in an action, because the first ram coming along goes slap into her. If you can stop the screw (and why not?) it is worth while having practice of that description, and that you should have fouling practice of some sort is all that I wish to advocate. Captain Brand spoke of the expense. Now I was very careful to say I did not propose to enter into any question of building ships, but I would try to do the best I could with what we had got. This big organization does not mean that these are all turret ships; I only think we ought to have turret ships for home quarters; the others are what you can improvise on the station. Then he spoke of the Commander-in-Chief having the fighting organization under his own control; that he must have. In the exhilarating influences under which he would have to fight, his brain would begin to work at a pace which probably it had never worked at before, and things would occur to him at the last moment which it would be impossible for any one, including the enemy, to know anything about beforehand, so that he must be left to take his forces into action on any principle that may come into his head at that particular moment. He may have exercised it over and over again, he may have been struck with some particular form that he liked best, and he goes into action on that formation. That is the only thing I wanted to put forward—merely a scheme by which we may make certain that he will have the stuff to work upon, but the action details must be left to him. Lieutenant Jackson spoke of the independent mother ship as against the parent in the composition of the fleet unit. Even then you want organization, because before you have the mother ship you must have so many children. When you have twenty-four children then you want a mother ship, and my experience of these children is that twenty-four of them would give the mother ship a very considerable amount of trouble, and that is what has led me to believe that the fleet-unit system was absolutely necessary for mutual support and the defence of the parent; using the "mother ship" principle for the attacking flotilla. Nearly all the propositions I have made to-day are debatable, and I am open to conviction on any point, and I have learned a great deal this afternoon. I thank you very much for the remarks you have made and the honour you have done me in attending.

The CHAIRMAN: It only remains for me to ask you to return thanks to our lecturer for his very interesting lecture. He is an Officer who has considerable experience, and is well fitted to speak on the subject, which is one about which naval Officers of the future and of the present must think a great deal. I hope that we have all learned something very considerable, and certainly we have a material which can be taken away and thought over, and I hope the results of that deliberation will be beneficial to the Service.



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	Gilbert, W. R., Revd., late Chaplain R.N.

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## OCCASIONAL PAPERS.

This portion of the Number is reserved for Articles, either Original or Compiled, on Professional Subjects connected with Foreign Naval and Military matters; also for Notices of Professional Books, either Foreign or English.

It is requested that communications or books for review may be addressed to Colonel Lonsdale Hale, at the Royal United Service Institution, Whitehall Yard, London, S.W.

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### THE "AUSTRIAN NAVY" FROM MIDSUMMER 1885 TO MIDSUMMER 1886.

A *Resumé* from the "Allgemeine Zeitung," München, 11th October, 1886.  
Translated by Commander GARBETT, R.N.

It is nearly three years since Vice-Admiral Baron Sterneck assumed the chief command of the Imperial Navy, and in this time much has been done in order to bring the sea forces of the monarchy up to a scale commensurate with the duties they have to perform, particularly when people consider that, in spite of the undeniable sympathies always extended to the Fleet, and in spite of the confidence which the administration of the Navy has won for itself, on a very small sum of money is yearly placed at the disposal of the Minister. Great skill is therefore displayed in doing all that is possible with the means, in avoiding everything which is not useful, and taking care not to omit things which from their importance are absolutely necessary; not only, therefore, must the matériel of the Fleet be held in a state of readiness, but equal attention must be paid to the education of the personnel, and the proper carrying out of the manifold political and commercial duties which fall to the lot of the Navy. Particular praise is therefore due to the present Administration for the skill with which they have handled all these questions. The programme of the year, which we wish here to report, has certainly suffered some disarrangement consequent on the events in the Levant, but on the other hand many opportunities have been afforded for important experiments and observations.

When at the end of the summer of 1885 the ironclad evolutionary squadron was placed out of commission, a cruising squadron under command of Commodore Baron von Spaun was fitted out; it consisted of the screw frigate "Radetzky" and the gunboats "Hum" and "Kerka," and cruised first in the Adriatic, going at the end of the year to the Levant. In August the corvette "Zrinzi" sailed to the West Indies, and the corvette "Frundsberg" through the Suez Canal to the East, both of them to visit all the important harbours; while the "Albatross" went to the Brazils, to be stationed there for a somewhat longer period. At the end of September the spar-decked corvette "Donau" with a division of cadets from the Marine Academy on board left for a cruise to the West Indies, North America, then to England and the Baltic, which had not been visited by an Imperial war-ship

since 1866. In addition, since 1884, the spar-decked corvette "Saida" had been stationed in the East Indies and Australia, and the gunboat "Nautilus" in China and Japan.

Never before have so many ships been on distant cruises at the same time, and it is in any case a matter of congratulation that the appearance of the Imperial flag has ceased to be considered as something remarkable. There have been no casualties during the cruises, with the exception that the commander of the "Donau" died suddenly at Havannah. The "Zrinzi" and "Frundsberg" returned according to programme in the spring of 1886, as also the "Saida," while the "Donau," after visiting Kiel, Carlscrona, and Kronstadt, started on her homeward voyage to Pola in the beginning of August.

The cruising squadron was ordered to Suda Bay, to join the International Fleet when the attitude of Greece towards Bulgaria assumed threatening dimensions, and the casemated ship "Kaiser Max" was sent to strengthen it, as well as the torpedo-depôt ship "Kaiserin Elizabeth," six 2nd class torpedo-boats, and somewhat later the torpedo-cruiser "Lussin." The division lay some weeks in Suda Bay waiting on events, and greeted the order to commence the blockade of the Greek coast as a welcome diversion. To the Austrian division fell the duty to watch the Gulf of Volo and the north entrance of Negropont; the Island of Skyathos was the headquarters for the torpedo-boats, and coal was completed at Salonica. The Italian squadron blockaded the southern entrance of Negropont and the Doro channel. The English with the German ironclad "Friedrich Karl" held the line from Cape Malea to Cape Colonna, with the Island of Milo as headquarters and coaling station; then came the Russian, whose instructions, however, were of a somewhat more friendly nature, while Syra was fixed upon as the central point for the telegraphic communication between the squadrons.

On the 16th May the "Radetzky," "Hum," "Elizabeth," and the six torpedo-boats arrived before Volo, the two first-named reconnoitred the channel, while the "Elizabeth" with the torpedo-boats went to Skyathos, anchoring on the morning of the following day; here the divisional commander issued a manifesto, announcing the peaceful intentions of the Imperial ships; at the same time possession was taken of the telegraph stations on purely military grounds, to prevent any information about the movements of the ships being bruited about. The torpedo-boats were employed on vedette duty, a brig and several smaller coasters being stopped and brought into the harbour; the ships proceeded as requisite to Salonica to complete with coals and stores. On the 7th June the blockade was raised, and the captured vessels released. The attitude of the inhabitants of Skyathos was very friendly the whole time, there being no truth in the reports that requisitions had been made on the people, and that they were consequently reduced to semi-starvation; on the contrary, the presence of the Austrian ships proved a source of great advantage to them. On the 8th of June the squadron returned to Suda Bay, from where the "Kaiser Max," "Elizabeth," and the torpedo division returned to Pola.

Although the blockade was bloodless, yet the service was sufficiently severe to fully test the satisfactory manner in which the ships had been fitted out. It had been intended to fit out in the summer of 1886 an evolutionary squadron with a strong division of torpedo-boats, and to undertake a long series of experiments in torpedo warfare, but the necessity of strengthening the squadron in the Levant, and the extra expense incurred thereby, together with a want of men, prevented the carrying out of this idea, and even when the blockade of the Greek coast came to an end, and it was intended to carry out some torpedo-boat evolutions on a small scale, the outbreak of cholera on the coast prevented the realization of the idea. How-

ever, the short blockade service afforded an opportunity of testing the seaworthiness of the torpedo-boats, and the utility of the electric light apparatus, and many valuable experiments were made, affording at least an insight into eventualities which might probably occur in war. In August the cruising squadron returned to Pola, while the corvette "Augusta" sailed to the East Indies to relieve the "Albatross," and the spar-decked corvette "Saida" started for the annual cruise with cadets, touching at Bahia, Rio de Janeiro, the Cape, and home via Mauritius and the Suez Canal. A winter squadron will cruise as usual in the Mediterranean under the command of Rear-Admiral Buchta.

Having thus given a short account of the movements of and work performed by the ships in commission, which have afforded good opportunities for the education and discipline of the personnel in their many duties, we will now briefly glance at what has been done for the matériel of the Fleet.

The programme laid before Parliament in 1884 by the Minister of Marine has been steadily kept in view and developed, efforts above all having been made to develop the torpedo department, the number of torpedo-boats of the 2nd class has been brought up to twenty-six. In England two larger boats—the "Adler" and "Falke"—have been built and fitted out; while two similar boats—the "Sperber" and "Habicht"—have been built at the now celebrated yard of Schickau at Elbing, which arrived at Pola in the course of last September. It is intended to bring the number of these 1st class boats up to twelve. The two torpedo-ram cruisers "Panther" and "Leopard" launched in England last summer proved their excellent sea qualities in the voyage to Pola, and are now ready for service. A vessel of similar type is being built in the private yard of the "Stabimento Tecnico" in Trieste. These ships are intended as cruisers and movable rallying points for the torpedo-boat division. They are built as rams but are unarmoured, with a speed of 18 knots, 69 metres (225 feet) long, a displacement of 1,570 tons, and an indicated horse-power of 4,000. Their armament consists of two 12-centimetre (5-inch) Krupp breech-loaders and 10 mitrailleuses. It is intended to build a fourth ship of this class. Several of the older ships, which till now have been used as tenders or hulks, but which are worn out, have been struck from the Navy List and broken up. At the same time there has been a new classification of the ships. The whole matériel of the Fleet is divided into four groups—ships for ordinary work, ships for special duties, school ships with their tenders, and hulks. The first group consists of the battle-ships, cruisers, torpedo-boats, avisos, train ships, and river vessels. The second group contains ships for special service abroad (mission ships, term explained below) and vessels for harbour and coast service; all ships are now designated as H.M.S. or H.M. Boat. Among the battle-ships are included eleven ironclads, two of which, however, the "Ferdinand Max" and "Kron-Prinz Rudolf" are still building. A further increase of these ships is not contemplated at present. Among the cruisers are included the torpedo-ships, of which, however, four of earlier construction are deficient in speed, as compared with the four of the "Panther" class. Of torpedo-boats there are four 1st class of the "Adler" type, twenty-six 2nd, and eight 3rd. The three yachts—"Miramar," "Greif," and "Fantasie"—are classed as avisos, but the number of these are to be brought to six. In the meantime the utilization of the Austrian Lloyd mail steamers for vedette service has not been overlooked. The river squadron includes the two monitors on the Danube. With regard to the so-called train ships, they comprise vessels which although not fighting ships must yet accompany a squadron of the latter for special duties; such are the torpedo dépôt ship, the "Cyclops" (fitted as a floating workshop for small repairs), the store ship "Pola," and the hospital ship "Garguani." The number of these train ships, in particular

the torpedo dépôt ships, is to be somewhat increased. In the 2nd group are comprised nineteen unarmoured ships, which, although not useful for modern warfare, are still perfectly fit for cruising and station duties abroad in peacetime. The list includes two frigates, "Laudon" and "Radetzky;" three spar-decked corvettes, "Friedrich," "Donau," and "Saida;" five corvettes, "Heligoland," "Fasana," "Frundsberg," "Aurora," and "Zorinzi;" six gun-vessels, "Narenta," "Sansego," "Hum," "Kerka," "Albatross," and "Nautilus;" and three river paddle steamers, "Taurus," "Trieste," and "Andreas Hofer." For harbour and coast defence are three small steamers. The group of the school ships includes one artillery, two torpedo and sea mine, one seamen's and one boys' training-ships, with their tenders, in all ten.

As the principal duty of the Austrian Navy lies in the defensive, so has every effort been made to fix on a firm basis the maritime defence of the coasts, and to obtain all the necessary factors for this purpose; a duty for which the Coast Survey Bureau has been established at Trieste. The marine section of the Ministry of War, at whose head is the Minister of Marine, has lately obtained a new statute, which establishes a special bureau which not only regulates the movements of all ships in commission in time of peace, but has also to make the necessary preparations and plans for warlike operations, to take care that the Navy is not taken by surprise, and to carefully watch the developments of foreign fleets. The latter duty is to-day of immense importance in view of the feverish activity reigning in all naval establishments abroad. Undoubtedly the torpedo question is the great question of the day, although the torpedo experiments and evolutions carried on last year by the French Fleet, under the direction of Admiral Aube, would show that that weapon and the boats have not yet quite come up to the expectation of their advocates, and that further experiments and in all probabilities changes in construction are necessary. The Imperial Navy, unfortunately, is unable to carry out complicated and costly experiments on a large scale, so it is all the more necessary to keep *au fait* with and to be ready to turn to good account the experience gained by other nations. The last year has been a year of good work, and it is a sign of the good spirit which the Marine Administration has infused into the whole Service, that in spite of the long illness of Admiral Sterneck, there has been no falling off in efficiency. The Minister has been suffering since the spring from inflammation of the lungs, which at one time threatened his life; he is, however, now completely restored to health, and on the 12th of September again took over the supreme command from Vice-Admiral von Eberan, and will at the next meeting of the Delegations himself bring forward his Budget.



## A GERMAN OPINION ON THE DELHI MANŒUVRES.

Extracted from the "Pioneer Mail" (India) of 23rd November, 1886.

THOUGH there is no doubt that our foreign visitors of last year were really most favourably impressed with the physique and turnout of our men, we have strong reason to believe that their opinion of the tactics and drill displayed at Delhi would, if openly expressed, have produced considerable commotion at headquarters.

A lecture was delivered in Berlin, at the Institute corresponding to our United Service Institute in Whitehall, by one of our guests, and of this lecture we are able to give the general gist.

"First, with regard to the infantry. The men show considerable aptitude for skirmishing, and are excellent for all light infantry duties, but the Officers, as a body, seem never to have properly appreciated the difference between an advance guard, skirmishing fight, and the decisive attack on a field of battle. The instructions for the attack were evidently drawn up by men entirely unacquainted with the European battle-fields of to-day. The attempt to avoid doubling up of different companies (*eindoubliren*) in the fighting line, by making each little company find its own support and reserve, is thoroughly unpractical, for it would be impossible in actual warfare to ensure each little detachment coming up precisely in rear of the little section of the front to which it belongs; it has the further defect of destroying, at the very commencement of the action, and unnecessarily, the Captain's control over his company. A man can command the extent of front required by the small English companies, but he cannot possibly keep in hand three separate bodies some 400 yards apart. As a consequence there is no unity of direction in the fighting line, and fire discipline is almost impossible to maintain.

"Besides, the English authorities do not appear to realize the losses inseparable from a general action, and that to carry a front of some 800 to 1,000 yards it is necessary to put in a whole Division. Battalions must be intermixed before even a distance of 700 yards from the enemy has been reached, and by the time the zone of decision (about 300 yards) has been attained, whole regiments will be required. This danger can only be guarded against by accustoming the men in peace to act under the order of the Officer nearest to them, and, on the part of the Officers, by re-dividing among themselves the commands as each reinforcement comes into line. This is the universal practice in Germany at present. The advance is altogether too slow; the fact that losses increase in proportion to the length of time during which the target is exposed appears not to have occurred to them.<sup>1</sup>

"The advance of the fighting line by successive small fractions and by short rushes of 30 yards, we consider altogether unpractical—the small fractions mask each other's fire, and the short rushes unnecessarily tire the men. Nor are these short rushes long enough to carry them out of the average cone of dispersion of the shots aimed at them, and it is easier for the defender to keep on them than it is where each range has to be re-estimated and the sights re-adjusted.

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<sup>1</sup> In the German attack, from the moment the signal for the advance is given, all troops in rear of the fighting line move off in quick time and never halt; if the fighting line is checked, they close on it, and carry it on with them. The usual distance between successive lines is about 400 yards.

"But most striking of all we consider to be the want of any true conception of the value of discipline in the fight. In camp and quarters the discipline of the English Army has always been very high, and formerly, when they fought in line, it was the admiration of all Europe. The writings of Generals Foy and Bugeaud, their defeated enemies, are well known in all German schools, and our own countrymen, who fought shoulder to shoulder with them in 1815, agree in the same high testimony; yet it does not appear to have occurred to the modern school of English leaders, that it was to this high discipline that they owed their success, and that, if that degree of drill was necessary to ensure the success of an advance against smooth-bore muskets, whose fire was hardly effective at 200 yards, how much more, therefore, it is necessary, when the troops behind the fighting line have all to cross a fire-swept zone of some 1,500 yards in depth, without firing a shot in return. The innate love of fighting which may be expected in a volunteer army, and which none who have read the records of the Peninsular and Crimean wars and of their campaigns in India will deny them, renders an iron discipline all the more essential if the troops in rear are to be prevented from taking the law into their own hands and joining the fighting line without orders. This was exactly what the Prussian Guards Corps did at St. Privat.

"In Germany we look upon discipline as the main sheet anchor on which we rely to overcome man's inherent fear of death and danger, and tighten up its bonds all the more when the critical moment arrives. In the English Army, on the contrary, exactly the reverse course is followed, and when the attack commences all the outward forms of discipline are abandoned.

"Turning now to the cavalry. The material leaves nothing to be desired; such men and such horses as the British cavalry regiments in India have, are not to be seen in any other country in the world. The Englishman is a born rider, and sits his horse with an ease and confidence our men can rarely attain to. The native cavalry also ride well, and even their horses are quite up to the average of our Hussar regiments. With such advantages, it is extraordinary that the cavalry is not better than it is. But here again the want of experience in handling large bodies of cavalry, the fatal fallacies which the breech-loader brought in its train, have all borne fruit. The general ideas on cavalry taught in the English schools, and the strong prejudice against them existing in the minds of the umpire staff, who almost invariably order them out of action if they attack either infantry or guns, have acted most prejudicially on all concerned. We ourselves knew what it was to suffer similarly, before the glorious day of Vionville, and can sympathize with our gallant comrades in arms; but they labour also under the disadvantage of a defective system of drill and elementary training of men and horses. Absolute uniformity of time and pace are the very essentials of combined action in cavalry tactics; but little attention is paid to either.

"The independence of the squadron and the use of the squadron column are two other points; but neither is as yet properly appreciated. Owing to the defective training of the young horses, and to the fact that the men are not taught to ride straight to their front, (keeping their dressing by time and an occasional glance of the eye, instead of by turning the head to the directing flank), the long advances in line are not well made, and the charge, though delivered at a high rate of speed, is wanting in cohesion, the files opening out, and the ranks not being kept sufficiently distinct. The *mêlée* and pursuit are not enough practised. Finally, the systematic training of the horses to cover long distances at speed has been hitherto ignored. Great inequality also exists between the different regiments, both of the native and British cavalry. It is almost impossible to compare the two ends of the scale in either case, and this reacts very prejudicially on their employment in brigade.

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young Officers largely from the ranks of the infantry, and who, having been trained for some years in the latter arm, fail to acquire that complete confidence in their new one, which every cavalryman should have. Further, never having been grounded in the principles of military equitation, they do not possess the necessary routine knowledge nor a sense of its important bearing on efficiency.

"The efficiency of artillery depends to such a large extent on accurate shooting that it is impossible to form an opinion of it in manœuvres. As with the other arms, the men and horses are of the first class and their discipline good; but want of experience in the handling of large masses on the part of superior Officers is apparent, and they were, moreover, much hampered by the provisional instructions published for the guidance of the higher commands during the manœuvres. The principle that artillery should not fire over infantry shows an extraordinary inability to grasp the conditions of a modern battle, and practically deprives the infantry of the co-operation which is so essential to success. Even in a fight of one corps against another, it would be impossible for the artillery to prepare the attack from a position on its flank, because, taking 2,000 yards as the distance between the two fronts, the outer battery of the line would be some 4,000 yards distant from the point of attack, and where several corps are fighting alongside of each other the idea is perfectly impracticable. It is a poor compliment to pay to their infantry to say they cannot stand what every other army in Europe stands willingly enough. The truth is the different arms of the Service in the English Army are not sufficiently closely united; there is too much caste spirit, they fail to perceive that each only exists for the other, and that the efficiency of an army is measured by the product, not the sum, of the efficiency of each arm."

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## A RUSSIAN CRITIC ON THE ANGLO-INDIAN ARMY.

From a "Journey to India in 1885-1886," by A. TIMLER. Published in the "Voennye Sbornik," April, 1887; translated by Captain HAMILTON, East Lancashire Regiment.

IN the Russian military magazine, the "Voennye Sbornik," there is now appearing an article entitled "A Journey to India in 1885-1886," from the pen of one of the military representatives of Russia at the Delhi manœuvres, which took place in the cold weather of those years. The first paper of the series, which appeared in the March number, deals mainly with the incidents of the outward voyage and arrival in India; the second paper, after describing some of the well-known sights of the country, passes on to a consideration of the manœuvres, and with this the military interest of the articles commences. The events of each day are duly chronicled, though without comment, and the text is elucidated by a sketch map of the country between Umballa and Delhi. The writer then proceeds to offer various critical remarks which appear sufficiently interesting and instructive to bear reproduction in full. Interspersed with these, there occur frequently in the text mere statements of events, extracts from the orders for the troops engaged, details of pay, allowances, enlistment, &c., without comment or remark, and these have been omitted in the following translations.

*Sir Frederick Roberts.*—Having dressed ourselves in uniform, which we wore throughout the manœuvres, we presented ourselves to Sir Frederick Roberts. Of small stature, and lean, with a somewhat stern aspect, although in reality he is a man above all things kind and affable, very genial, indefatigable and energetic, he exercises perforce an involuntary attraction upon everyone who may chance to meet him. As far as one could observe, he enjoys the trust and confidence of his subordinates, and in truth Sir Roberts is decidedly no common General, though his operations in Afghanistan have nevertheless incurred the censure of some severe critics.

*The Foreign Officers' Mess.*—The foreign Officers, with the English Officers attached to them, breakfasted and dined in a separately appointed mess, and every day throughout the manœuvres the commanders of the troops of those Divisions near which our camp was pitched were invited in turn to our dinner. In this manner by the end of the manœuvres we had made the acquaintance of nearly all the senior Officers, and thus had an opportunity of forming an opinion as to the composition of that body of men who left upon us a most favourable impression.

*The Manœuvres.*—Manœuvres, in the sense in which they were carried out near Delhi, took place now for the first time since the organization of the Anglo-Indian Army; usually in these gatherings an insignificant number of troops took part. According to the regulations in force, troops remain in their several garrisons for three years, whence they move in relief. By thus availing themselves of the yearly change of quarters of a certain number of regiments, the War Ministry gives the necessary orders to the troops already on the march in the due course of events, and so arranges that a certain force shall arrive simultaneously at the point fixed for the formation of a brigade or Division, and serve under the command of the local senior commander for ten or fifteen days. In this time the combined instruction of all three arms is carried out, and minor manœuvres. Gatherings such as these are useful as affording practice to the junior commanders and to the troops, but by no means to the Generals. At the present manœuvres the

desire was rather to test the commissariat, transport, and hospital services. It is quite true though that the aim of the manœuvres had a certain political tendency, but we cannot enter into a discussion on this point.

On every occasion, while attending the manœuvres, we took the opportunity of making a close inspection of the native army, about which especially they have a very confused idea in Europe.

Having regard to the fact that the chief arbitrator of real war—the bullet—was absent on this occasion, rules were introduced into the instructions laying down precisely the losses in attack and defence, and defining the relative strength which should turn the scale in favour of one side or the other. This latter rule was applied sometimes very literally by the umpires, which led to some commanders bringing up far too large a number of men into the fighting line—regardless of the fundamental principles for the conduct of a fight—and thereby depriving themselves of an indispensable reserve, simply and solely that they might not be ordered by the umpire to retire in consequence of the numerical superiority of the opposing force.

*An Episode.*—At the end of this day's (the 14th January) manœuvres, we were witnesses of a most curious episode. While following in rear of a Bengal cavalry regiment we heard loud cries, and on looking to see from whence they came—in front of the regiment about 100 paces off, there dashed out a huge wild boar. Some men started off from the front, with the commander of the regiment at their head; the sport began, and we followed. The boar overtaken by the commander of the regiment received so powerful a thrust with a lance that the bamboo shaft broke, but the lance stuck in. Regardless of his frightful wound, the enraged beast began to hurl himself on every side upon the horsemen who surrounded him, and it was only after two successive lance thrusts that they succeeded in finishing him.

*The Manœuvres.*—We abstain from a valuation of the manœuvres, since a critical inquiry into these interesting drills may lead to false deductions, and give a perverted idea of the Anglo-Indian Army to those who have not had an opportunity of making themselves personally acquainted with it. Above all it must be mentioned that great manœuvres were carried out for the first time, hence it is not surprising if in this case errors were apparent in a greater degree than in other armies who devote yearly a considerable period to manœuvres. Indeed, the very mistakes, strictly speaking, arose, in the main, not so much from the system of training the troops, as from the non-acquaintance of the commanders with the practical principles for the management of manœuvres.

Without touching on the organization of the Anglo-Indian Army, on which head minute detail was given in the "Voennye Sbornik" (in the February number of the present year), we will endeavour to fill up the indicated outline with some information, in our opinion, not devoid of interest.

India serves as an excellent school for the English Army, the regiments of which are sent here in turn for a fixed number of years, and therefore in India it is expressly necessary to study the official practical work, and the military training of the troops; but by no means so in England, where, in consequence of various local conditions, the army cannot be trained and educated strictly in the spirit of modern war requirements. The English Officers themselves, with whom we chanced to speak on this subject, recognize the fact.

*English Officers.*—The main strength of the Anglo-Indian Army lies in the existence of a body of Officers of a totally different type from that which we are accustomed to see in other countries. The time is long past since the younger members of the aristocratic families had the sole and prescriptive right to service in India. The reorganization of the army after the Sepoy Mutiny, by the increase of commands, by the transfer of Officers to various

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posts in the administration of the country, demanded a large increase in the staff, and at the present time among the Officers representatives are met with of all classes of English society. Arriving in India as young men, and living permanently in the narrow circle of regimental society, they quickly gain the countenance and consideration of their brother Officers, and thanks to their early training they show themselves extremely well educated.

*Sport*, so innate among the English, can be followed in India in many and various forms, and this in its turn brings to perfection in the Officers those qualities of adventure, boldness, decision, and quick perception which are so indispensable to a military man. Consequent on the present system of maintaining the English and native armies by enlistment (and therefore from the most diverse elements), the task of the Officers is far from light even in peace, but especially in war. For the preservation of their authority they must serve as an example to their subordinates, and with this idea it is worth while to trace out from the various English expeditions, and so discover for oneself, the fact, that the loss per cent. among the Officers in comparison with the casualties among the lower ranks is much higher in the English than in other armies. The relations between commanders and subordinates being so well ordered and so firmly established, mere outward distinctions have no special significance. Plain clothes may be worn off duty, but at the same time a semi-uniform is strictly forbidden, such as a mixture of uniform and plain clothes, and for dinner at the Officers' mess a special uniform is required. In plain clothes or in uniform, the seniors always preserve their authority, and the juniors bear themselves respectfully towards them, preserving their dignity without servility.

The Officers of all arms of the Service ride well, and everyone keeps a horse, and moreover they practise every day in their leisure time when off duty various kinds of games such as lawn-tennis and cricket. Polo, a somewhat difficult and dangerous game on horseback, which requires good horsemanship, is similarly played everywhere, and in addition contests are held between regiments.

*The Native Officers.*—The native Officers are placed in an entirely different position, both as regards their official status and material advantages. They are selected from among the non-commissioned officers, not by seniority but by the choice of their commanders, and they attain in the infantry to the rank of company commander, and to that of troop commander in the cavalry. Without any technical military education whatever, but with a large practical experience of fighting, these Officers are excellent commanders as far as the interior management of small units is concerned, and in time of war they have shown themselves quite at home in campaigns and expeditions against savage races. Since they fully recognize the fact that the native Officers owing to their deficient training are not fitted for the requirements of modern war, and none the less from political considerations, the English have no desire to give them a chance of acquiring a military education. There was recently discussed the question of the increase of the cadres of the English Officers in the native infantry regiments, so as to include the rank of company commanders, and a certain Major Young gave a public lecture in Simla upon this subject, but so far the Government has shelved the question for financial reasons. Just so, the question was raised in the local press about the service of a large number of Officers in the civil administration of the country, and the conclusion arrived at—extremely justly—was, that the regulations at present in force influence the army for harm, and greatly weaken the cadres of Officers.

The English Officers keep themselves very much apart from their native brother Officers, and except in official matters no intercourse exists between them. In this point then lies the heel of Achilles, the one vulnerable spot of



the Anglo-Indian Army, which in itself represents a trunk to which is glued a foreign head.

*English Troops.*—The English troops of all three arms which we happened to see were composed of young men, with the exception of the non-commissioned officers, among whom are found many older soldiers. Upon these latter depends the entire detail of the interior economy, and they enjoy always numerous rights and privileges by which they are separated in a marked degree from the lower ranks. Of the maintenance of the soldier there is nothing to say, they are always well lodged, not only in moderate comfort but even with a superfluity of comforts in some garrisons, and especially so in comparison with the native army in respect to barracks and quarters. The distinction in this is so prominently marked that no hygienic reasons or arguments of a similar nature can serve as a justification.

*The Native Infantry.*—The native infantry is composed of voluntarily enlisted men, serving under a fixed agreement, the standard for a recruit being not less than 16, or more than 25 years of age, nor less than 5½ feet in height, with the exception of the Goorkhas, who are especially of small stature.

The best regiments are composed of Sikhs and Goorkhas; the first being Hindoos inhabiting the Punjab, forming a separate religious sect, which arose in the year 1469, a mixture of Buddhism and Mahometanism. Among their principal religious customs the Sikhs never cut their hair, and tie up their long beards very dexterously under the turban. The Goorkhas, who live in Nepal, have a regular Mongolian type of countenance. They are of small stature, but of very powerful build, excellent shots, and are clearly distinguished from the other portions of the army by their smartness and by their dark uniforms.

*Bengal Cavalry.*—Besides the native infantry, the Bengal cavalry enjoys a well-deserved celebrity. The outward appearance of the men is very good, the riders sit strongly on their horses, with an easy seat, thanks to the quality of the native horses and to the habitual practice of the men. The individual riders are distinguished by extraordinary agility and suppleness, and the horses go boldly forward without paying attention to the broken and intersected country, and lightly overcome the obstacles.

The native cavalry yield to the English in steadiness, in ease, and in quietness, but it has a much smarter appearance. Before the attack their formation is looser, but they charge with more vigour and with loud shouts.<sup>1</sup> Although this cavalry is called irregular, nevertheless in steadiness and training it differs but little from regular cavalry, especially those regiments who have smart Commanding Officers at their head.

*Uniform.*—The uniform consists of parade and ordinary or marching kit. The first—which in the majority of regiments is made of red cloth—is very ill-suited to the climate, and is only a source of unnecessary expense; the second, on the contrary, can be used on all occasions, and the native regiments in this dress have a much more soldierly appearance than in the parade uniform. At the manœuvres, when the men lay down, the colour of the clothing so blended with the colour of the ground that at a distance it was difficult to distinguish between them. This clothing is called “khaki,” and is made of a light but very strong drill, which has this one disadvantage—that it fades somewhat after washing, and so uniformity of dress is destroyed; this, however, will be satisfactorily settled by a certain method which has been adopted by the Government from an English manufacturer. We wore this dress out hunting, and were very pleased with it.

<sup>1</sup> The word used is “Geek!” the Cossack battle-cry.

*The Contingents of the Native States.*—Here, by the way, we must mention the forces of the semi-independent States, some contingents of which, as above detailed, were present at the manœuvres. Although in regularity they are inferior to the native army, still all the same a certain amount of discipline is apparent, and in time of war they might be employed for duties of a secondary nature.

Out of the whole number of the troops of the semi-independent States, which reach the enormous total of 325,000 men, only a portion has more or less of a regular organization; the greater part consist of irregulars, recruited from various parts of the country. Large sums of money are expended on their maintenance, and there is nothing to show for it, for they form in reality an armed mob, very dangerous in case of internal complications. It would be more advantageous to the Anglo-Indian Government if the princes, following the example recently set by the Guicowar of Baroda, were to disband their irregulars and maintain a force organized after the manner of the native army.

*Transport.*—Transport forms the weakest part of the English Army. The soldier, it is laid down, carries nothing on him but arms and ammunition. When we asked the English why they do not apportion some of the baggage carried by the transport to the backs of the soldiers, everyone had but one answer, namely, this, "Each soldier brought from England to India costs 100*l.*; we are obliged, then, to keep him in full strength." This reply is not a commercial valuation, but amounts to a statement that on account of the prevailing system of enlistment it is not so easy to get a man of satisfactory physical condition for service in a country like India, where the climate is very dangerous to Europeans, and life is rendered possible only by considerable comforts and by the strict observation of certain rules of health.

The English find that, for the training of a soldier to the hardships of a marching life, there is no necessity to pile on him the various burdens which arise from the military nature of his duties, but that it is better to bring him into action fresh and vigorous, and so make it possible to demand of him a great exertion of strength when required for the execution of a settled plan. This explains to a great extent the necessity for that crowd of followers who do the work which in other armies is wholly imposed on the fighting contingent. In those cases, moreover, when known exertions can serve a useful end, they do not hesitate to impose such on the soldier. Thus all the troops at the assemblage, regardless of the existing railways, carried out the movements to the camp and back by the usual marching routes, and out of 76 separate detachments, 15 went 1,500, 31 about 1,000, and the remainder on an average from 400 to 500 versts,<sup>1</sup> and only 7 detachments, after reaching certain points, were forwarded by rail.

The opinion has usually been established that the English cannot get on without a large amount of transport, that their Army consequently has little mobility, and that they are in complete dependence on their means of transport. We can only agree with this up to a certain extent, as in this view of the case the fact is lost sight of that all English expeditions have been into distant countries, where in general the climate is hurtful to Europeans, each individual soldier is charged in the bill, and, therefore, those sacrifices are not made which might not repay his keep.

The train, as a rule, forms a burden to an army, without which one cannot get on, but in every case pack animals are preferable to wheeled transport in all respects, and therefore, if forage and water can be found in sufficient quantity, it does not follow, in fixing the strength of the train, that it should be

<sup>1</sup> A verst = 1166·6 English yards.

reduced to the narrowest limits possible. It is better to have an extra thousand pack animals than to increase the burden of the soldier by a few pounds. In conclusion, pack transport, as also every other kind of equipment, cannot be improvised at the moment of absolute necessity.

*Health of Troops.*—From a consideration of these statistics (giving percentage of sick, &c.) it will be noticed that, notwithstanding commodious quarters, good food, and sanitary stations, the sickness among the European troops, which results solely from climatic conditions, is very considerable. In the report the causes of sickness among the native troops are very carefully detailed, and these consist mainly in the faulty localization of the barracks, which are inconvenient and badly ventilated.

*The March Past.*—In accordance with the Regulations, the troops marched past by corps, and in each the cavalry went by first, then the artillery, then the infantry. From the passage of the cavalry and artillery the ground was much cut up, and so the movements of the infantry were made very difficult. Men of the native infantry regiments who wore shoes on bare feet frequently lost them. As the result of this the following order appeared, "In native regiments laces must be worn with shoes for parades and inspections."

Regardless of the bad weather and the march through the rain, the troops in general bore themselves well, and some infantry regiments, English and native, marched so steadily that they would have satisfied the most exacting critic of that age when the march past was considered as the crowning achievement of military training.

## NOTICES OF BOOKS.

*The Nation in Arms.* Translated from the German of Lieutenant-Colonel Baron von der Goltz by PHILIP A. ASHWORTH. London: Allen, 1887. Pp. 341. Size 9" x 6" x 1½". Weight under 2 lbs. 1 oz. Price 15s.

In the last but one number of this Journal appeared an article from the pen of Colonel Sir Lumley Graham, entitled "A Sketch of War as it will be." It consisted of translations of some portions of the original of the work now under notice, "Das Volk in Waffen." Any one who has read these extracts cannot fail to recognize in the author of "Das Volk in Waffen" a master in the art of modern war, and to desire to have the book *in extenso* before him. The whole book has been translated by Mr. Ashworth, and is now available for English readers. "Das Volk in Waffen" is invaluable to the modern soldier, and although, perhaps, the translation is by no means faultless, it is entitled to a place in every military library.—L. A. H.

*Der Deutsch Dänische Krieg, 1864.* Herausgegeben vom Grossen Generalstabe. Erste Band. Berlin: Müttler, 1886. Pp. 490. Size 10" x 6" x 1". Weight under 2 lbs. 14 oz. Price 26s. 6d.

With maps, plans, and supplementary appendices.

Overshadowed as has been the campaign of 1864 in Schleswig-Holstein and Jutland by those of 1866 and 1870-71, we nevertheless greet with satisfaction the tardy appearance of this work, the perusal of which is amply repaid by the care with which it has been compiled. It embraces in three sections and ten chapters the events preceding and during the campaign up to the 18th of April, and will be followed by a second part, which will include the operations which led to the fall of the Düppel position and the close of the campaign. The first section embraces the political and historical sides of the questions which led to this war, a war which, however much it has been cast into the shade by those which succeeded it, was indubitably the first step, however little suspected at the time, which led up to the crowning event of the 18th January, 1871, at Versailles. But beyond the political considerations which fill the first chapter, the remaining chapters of this section depict the nature of the forces about to be engaged, the theatre of the war, the preliminary assembly of the troops on both sides, and occupation of Holstein. The second section carries us to the advance across the Eider and evacuation of the Dannewerk, the affairs at Missunde, Oberselk, and Jagel, the pursuit of the Danish rear-guard, and the advance to Flensburg, including the affair at Översø on the 6th February. Section 3 narrates the investment of the Danish position at Düppel by the 1st Corps of the allied troops under the command of Prince Frederick Charles of Prussia, and the advance of the 2nd Corps (Austrian) under General von Gablenz, and of the 3rd Corps (Prussian) to the Danish frontier at Kolding, which fill the first chapter of this section. The second treats of the occurrences before Düppel up to March 7th; the steps taken to ensure security to the lines of communication; and the state of affairs at sea—including also the reconnaissance in force before Düppel on the 22nd February. Chapter 3 depicts the political situation in the early days of March, and the train of events on the Jutland frontier previous to its passage by the allies on March 8th. The fourth chapter brings up the narrative to the 18th April, so far as regards the operations in Jutland; including the affairs of the 8th March at Veile and in front of Frederica.

It goes without saying that the work, so far, has been written with great care; that is certain to be the case in regard to any work published by the Military

History Department of the German General Staff. Putting aside all political considerations, both as regards the causes and the conduct of the war, one cannot but be surprised at the general state of unpreparedness of the Danish Government, and at the inadequacy of the power of defence. We look with interest to the publication of the second volume, and venture to express a hope that a translation of this prelude to the narratives of the subsequent wars may be undertaken by the Intelligence Branch of the Quartermaster-General's Department.—B. W.

*The Rise of the British Power in the East.* By the late Hon. MOUNTSTUART ELPHINSTONE. Edited by Sir EDWARD COLEBROOKE, Bart. London: John Murray, 1887. Pp. 543. Size 9" x 6 $\frac{1}{4}$ " x 2 $\frac{1}{4}$ ". Weight under 2 lbs. 10 oz. Price 16s.

The papers which constitute the groundwork of this book are chiefly manuscripts from the pen of the late Hon. Mountstuart Elphinstone, whose intention was to have written a third volume of his *History of India*, but circumstances having prevented this, they have been collected and put into shape, and together with notes drawn from the best authorities, and a concluding chapter added by the editor, complete one of the most comprehensive and interesting histories of the "Rise of the British Power in the East" that has come under our notice.

The period embraced in the work lies between 1486, the date of the first Portuguese expedition to the East, and 1783, the year which witnessed the final withdrawal of the French from India, leaving Great Britain sole trustee for the welfare of that country with its 250,000,000 inhabitants, with the consequent responsibilities attached to that office.

We earnestly recommend a study of this work to all those who wish to form an unbiassed opinion and a correct view of the most important events and vicissitudes which have resulted in the formation of the Indian Empire on its present basis.—M. G.

*The Campaign of the Cataracts, being a Personal Narrative of the Great Nile Expedition of 1884-85.* By Colonel Sir W. F. BUTLER, K.C.B. London: Sampson Low, 1887. Pp. 369; and Appendix. Size 9" x 6" x 2 $\frac{1}{2}$ ". Weight 2 lbs. 10 oz. Price 18s.

It would be a work of supererogation to do more than simply bring to the notice of English readers the publication of the personal experiences of Sir W. Butler in the Nile Expedition. But the work has a value far beyond, perhaps, what at first sight it possesses, for it will give to the Officers of Continental armies a truthful idea of the great difficulties we sometimes encounter in our so-called "little wars," and of the indomitable, steady, quiet determination to do and to endure which is a characteristic of the British soldier.—L. A. H.

*The War in Egypt and the Soudan.* By T. ARCHER. London: Blackie and Sons, 1886. 4 vols. Pp. 1120. Size of each vol. about 10" x 7 $\frac{1}{2}$ " x 1 $\frac{1}{4}$ ". Weight under 9 lbs. 14 oz. Price 17. 18s.

This is a work well got up and very readable, but we do not think that the author has been in the position which any one who aspires to be a military historian must occupy if his work is to be worthy of its subject, namely, "behind the scenes." We doubt whether he has even been very near the foot-lights. Mr. Archer's work may be considered to be a popular version of the War in Egypt and the Soudan, but we cannot conscientiously assign it a higher place in military literature.—L. A. H.

*Australian Defences and New Guinea.* Compiled from the papers of the late Major-General Sir Peter Scratchley, R.E. By C. KINLOCH COOKE. London: Macmillan, 1887. Pp. 413. Size 9" x 6" x 1 $\frac{1}{2}$ ". Weight under 2 lbs. Price 14s.

This is a very interesting book. In it Sir Peter Scratchley's views on Colonial Defence have been carefully collated by Mr. Kinloch Cooke, of the Inner Temple, from the papers and memoranda left by Sir Peter on the subject.

Sir Peter served for twenty-nine years in the Royal Engineers, being employed for a considerable period in the Australian Colonies. He was therefore fully competent to take up the question of their defence, being further qualified for his task by his attributes of excellent common sense, thorough professional knowledge, and great energy.

The substance of Sir Peter's opinions will be found in Chap. V and VI, "Local Forces"  $\alpha$  and  $\beta$ , in which he formulates a scheme of defence such as will enable the Colonies "to meet and repel a raid upon commerce along their coasts, or an attempt to overpower the defences provided at the principal ports."

Wordsworth says :

"When I have borne in memory what has tamed  
Great nations, how ennobling thoughts depart  
When men change swords for ledgers, and desert  
The student's bower for gold,—some fears unnamed  
I had, my country!"

And if the poet's fears were well founded, we entertain yet graver fears that the development of the military from the commercial spirit will be attended by yet greater difficulties.

It is, in our opinion, very unfortunate that Sir Peter Scratchley should not have lived to have pressed his views upon the authorities, the more so because his Colonial experience made him very sensible of the great difficulties.—E. H. C.

*Service Afloat, or the Remarkable Career of the Confederate Cruizers "Sumter" and "Alabama" during the War between the States.* By Admiral R. SOMMES. London : Sampson Low, 1887. Pp. 833. Size 10"  $\times$  7"  $\times$  2 $\frac{1}{4}$ ". Weight under 3 lbs. 14 oz. Price 16s.

We believe that this work appeared under a somewhat different title some years ago. The book may, we presume, therefore be regarded as a new edition. The incidents narrated lose none of their interest from the lapse of time since the War of Secession.

*The Practice and Procedure of Courts-Martial and Disposal of Offences by Commanding Officers.* By Colonel GEORGE COX, Royal Irish Fusiliers. London : Harrison & Sons, 1887. Pp. 138. Size 12 $\frac{1}{4}$ "  $\times$  8 $\frac{1}{4}$ "  $\times$   $\frac{3}{4}$ ". Weight under 1 lb. 10 oz. Price 10s.

Colonel Cox has compiled a work which will be found most useful as a clue in the intricate labyrinths of Military Law. It is not intended for instructional purposes, but as an aid to Officers in their duties, and we have no hesitation in strongly recommending it to them.—L. A. H.

*Military Law, with a Chapter on the Military Law for Foreign States.* By Lieutenant-Colonel TOVEY, R.E. Chatham : Gale and Polden, 1887. Pp. 386. Size 8 $\frac{1}{4}$ "  $\times$  6  $\times$  1 $\frac{1}{4}$ ". Weight under 1 $\frac{1}{4}$  lbs. Price 5s.

Lieutenant-Colonel Tovey has written this book avowedly for instructional purposes, i.e., for those who have to study law with an examination in prospect, and yet he has succeeded admirably in not making a mere "cram" book. We have submitted it for opinion to an Officer who is an admirable teacher of this difficult subject, and his verdict is so favourable that we have much pleasure in commending the work to the notice of those who are either being prepared or are preparing others for Army Examinations.—L. A. H.

*Records of the Waterford Militia, 1584 to 1885-86.* Compiled by Major O. W. CUFFE, 1885. Pp. 112; and Appendix. Size 8"  $\times$  5"  $\times$   $\frac{3}{4}$ ". Weight under 1 lb. Price 16s.

This little work is far less ambitious than its title would lead to suppose. It is a record, social as well as professional, and is really intended rather for Officers of

the regiment than for the public. These "records" are, however, sometimes looked up by antiquaries who hope to find in them a stray ray of light to enable them to penetrate into the dimness of the past. It is, therefore, desirable to say that Major Cuffe gives us only  $3\frac{1}{2}$  lines for the period from 1584 to 1765, whilst  $4\frac{1}{2}$  pages sparsely sown with large type suffice for the rest of the eighteenth century.—L. A. H.

*Note.*—Several works of an important character have been received and will be noticed or reviewed in the next number of this Journal.—L. A. H.



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